

AUSTRALIAN CUMACEA. No. 9<sup>1</sup>  
THE FAMILY NANNASTACIDAE

By HERBERT M. HALE, DIRECTOR, SOUTH AUSTRALIAN MUSEUM.

Fig. 1-49.

INTRODUCTION.

The material now dealt with was taken in shallow water off eastern and southern Australia, between latitudes 27° and 41° S. Some of it was secured by officers of the South Australian Museum, the bulk of it, as previously acknowledged, by Mr. K. Sheard, Division of Fisheries of the Council for Scientific and Industrial Research, while thanks are due also to Mr. I. S. R. Munro (Assistant Research Officer of the Fisheries Division), who very kindly recently submitted a formalized Cumacean collection made by him in Moreton Bay (Brisbane), Queensland.

Scarcely anything is yet known of the Cumacea of the northern coast of Australia and little more of those from the western coast. Russell and Orr (1931, fig. 1) published a map showing that most of the oceanographic research in the Western Pacific, prior to the Great Barrier Reef Expedition, has been concentrated in the region of the Dutch East Indies and the Philippine Islands. Since then investigations have been carried out by the Department of Zoology, University of Sydney, and the C.S. and I.R. Division of Fisheries.

FAMILY NANNASTACIDAE.

*Picrocuma* Hale, a genus with some unusual characters, is now referred to this family. Including the twenty-five species herein described as new, the thirty-four named members of the family occurring along the Australian coast are distributed among the genera as follows: *Nannastacus*, 10; *Schizotrema*, 1; *Cumella*, 7; *Picrocuma*, 1; *Campylaspis*, 14; *Procampylaspis*, 1.

As regards *Procampylaspis*, it is interesting to find south of the southern tropic a form which differs very little indeed from the boreal genotype (see remarks by Zimmer, 1913, p. 483 *et seq.*).

Genus NANNASTACUS Bate.

*Nannastacus* Bate, 1865, p. 86; Stebbing, 1913, p. 168 (syn. and key); Zimmer, 1921, pp. 133-134 (keys).

Zimmer keys the species which have the peduncle of the uropod less than twice as long as the telsonic somite. He omits *hirsutus* Hansen which he considers is a *Cumella*, and is of opinion that *sarsi* Kossmann is probably referable to *Schizotrema*. Only one species (*gurneyi* Calman) has been described as new since 1921. In 1936 I recorded material of the genus from South Australia as representing three of Calman's species. Since then further specimens have been collected and it is now considered that they should be regarded as distinct species and not variants (Hale 1937, p. 73). Zimmer mentions that specific differences

(1) For No. 8 see *Trans. Roy. Soc., S. Aust.*, lxiii, 1944, pp. 225-285, fig. 1-38.

within this genus are often slight. He uses the proportions of peduncle, rami and distal spines of the uropod largely in his key; these proportions vary very little indeed in the same sex of Australian species of which long series of adults are available. The number of spaced short spines on the inner margin of the endopod of the uropod of the species having the peduncle of that appendage short is also constant; these spines may be preceded by a short seta, much more slender than the stouter spines, and the margin also bears minute spinules.

In all Australian species where the adult male is available the exopodal recess in the basis of the peraeopods of this sex has a more or less developed comb-like outer edging: these flattened spines are absent in *mystacinus* Zimmer from New Britain (Zimmer, 1921, pp. 134 and 139).

Zimmer evidently does not consider necessary *Paranannastacus* Stebbing (1912, p. 164) which was established to accommodate Calman's *Nannastacus reptans* and *tardus*, and it would seem that the suppression of an exopod here and there in the female is not of particular significance in this genus (Calman, 1911, p. 360). The females of the Australian species, where available, have well-developed exopods on the first and second peraeopods; in *inflatus*, *subinflatus* and *johnstoni* spp. nov. there is no exopod on the third maxillipeds in this sex.

As in the case with *Cumella*, males greatly predominate, indeed are practically exclusively present, in collections secured on the bottom by submarine light (Sheard, 1941, p. 12) and in surface material taken by tow-net. Females of littoral species which are found on reefs have been secured by using the formalin method (Hale, 1936, p. 404).

Altogether seven species are now named as new; both sexes are available in four of these, the male only of the others being described. Unless, as in the case of these males, the body armature is distinctive, the practice of authors has been to avoid naming members of the genus from this sex alone.

The most northerly records of the genus on Australian coasts are, on the west *nasutus* Zimmer (lat. 27° S.), and on the east *suhmii* Sars (lat. 16° 23' S., Foxon, 1932, p. 392).

Zimmer's keys are here modified to include all species at present named.

## KEY TO MALES OF SPECIES OF *NANNASTACUS*.

The female also is known in the species marked (\*).

- |   |                               |
|---|-------------------------------|
| 1. Uropod with peduncle at least twice as long as telsonic somite .. .. .   | 2.                            |
| Uropod with peduncle less than twice as long as telsonic somite .. .. .   | 5.                            |
| 2. Pseudorostrum long, the lobes meeting for a distance equal to at least one-sixth of length of carapace .. .. .   | 3.                            |
| Pseudorostrum with lobes meeting for a much shorter distance .. .. .  | <i>lepturus</i> Calman.       |
| 3. Propodus of first peraeopod less than twice as long as dactylus .. .. .  | <i>longirostris</i> Sars.     |
| Propodus of first peraeopod about three times as long as dactylus .. .. .   | 4.                            |
| 4. Peduncle of uropod less than twice as long as endopod .. .. .  | <i>brachydactylus</i> Calman. |
| Peduncle of uropod at least twice as long as endopod .. .. .  | <i>nasutus</i> Zimmer.*       |
| 5. Dorsum of pleon with conspicuous paired spines (or elongate tubercles) on at least first five somites .. .. .  | 6.                            |
| Dorsum of pleon with conspicuous spines or tubercles on at most first two somites .. .. .   | 14.                           |
| 6. First four pleon somites each with a pair of subcylindrical dorsal processes, which with their apical spines are higher than vertical depth of the somites .. .. . | <i>hanseni</i> Calman.        |
| Pleon somites with at most low dorsal processes, which together with their apical spines are never as high as vertical depth of somites .. .. .                       | 7.                            |
| 7. Dorsum of fourth and fifth peraeon somites strongly raised medianly .. .. .  | 8.                            |
| Dorsum of fourth and fifth peraeon somites not raised medianly .. .. .  | 9.                            |

8. Dorsum of each pleon somite with a pair of serrate dorsal carinae, the teeth acute *ossiana* Stebbing.  
 Dorsum of each pleon somite with two rows of blunt-ended large tubercles *inconstans* sp. nov.
9. Peduncle of uropod fully as long as telsonic somite and barely shorter than endopod. Large dorsal spines (or tubercles) of anterior pleon somites clavate .. *clavatus* sp. nov.  
 Peduncle of uropod much shorter than either telsonic somite or uropod. Large dorsal spines of anterior pleon somites acute or subacute .. .. 10.
10. Endopod of uropod not more than twice as long as peduncle .. *brivicaudatus* Calman.\*  
 Endopod of uropod more than twice as long as peduncle .. .. 11
11. Antero-lateral angles of carapace serrate .. .. 12.  
 Antero-lateral angles of carapace not serrate .. .. 13.
12. Pseudorostral lobes meeting below. Exopod of uropod about one-third as long as endopod *unguiculatus* (Bate).<sup>7</sup>  
 Pseudorostral lobes gaping below. Exopod of uropod very short, about one-tenth as long as endopod .. .. *asper* sp. nov.
13. Back and sides of carapace spinose .. .. *sarsi* Kossmann.  
 Back and sides of carapace not spinose .. .. *stebbingi* Calman.
14. Peduncle of uropod distinctly longer than telsonic somite .. *sheardi* sp. nov.  
 Peduncle of uropod shorter than telsonic somite .. .. 15.
15. Including the terminal spine in the length of each ramus, the exopod of the uropod is barely more than one-fourth as long as endopod .. .. *submit* Sars.\*  
 Measured thus, the exopod of uropod is at least more than one-third as long as endopod 16.
16. Terminal spine of exopod of uropod reaching to distal end of endopod (without its spine) *pardus* Calman.  
 Terminal spine of exopod of uropod not reaching to distal end of endopod .. .. 17.
17. First pleon somite with a distinct median, longitudinal, dorsal pit *georgii* Stebbing.  
 First pleon somite with no pronounced dorsal pit .. .. 18.
18. Terminal spine of exopod of uropod not reaching beyond middle of length of endopod (not including terminal spine of latter) .. .. 19.  
 Terminal spine of exopod of uropod reaching beyond middle of length of endopod (not including terminal spine of latter) .. .. 20.
19. Antero-lateral corner of carapace rounded. Last pedigerous and first pleon somite with no dorsal tumidities .. .. *sauteri* Zimmer.\*  
 Antero-lateral corner of carapace with spine. Last pedigerous and first pleon somite each with a dorsal tumidity .. .. *inflatus* sp. nov.\*
20. Basis of anterior peraeopods with the usual external lamellate spines .. .. 21.  
 Basis of anterior peraeopods without external lamellate spines .. *mystacinus* Zimmer.\*
21. Carpus of fifth peraeopod shorter, or barely longer, than propodus .. .. 22.  
 Carpus of fifth peraeopod half as long again as propodus .. *simmeri* Calman.
22. Integument granulate. Last pedigerous and first two pleon somites each with a pair of dorsal spines. Inner margin of endopod of uropod with five short spines *subinflatus* sp. nov.\*  
 Integument smooth. No dorsal spines on pedigerous or pleon somites. Inner margin of endopod of uropod with six spines .. .. *johnstoni* sp. nov.\*

KEY TO FEMALES OF SPECIES OF *NANNASTACUS*.

The male also is known in the species marked (\*).

1. Uropod with peduncle at least twice as long as telsonic somite .. .. 2.  
 Uropod with peduncle much less than twice as long as telsonic somite .. .. 3.
2. Pseudorostral lobes meeting above for greater part of length, but divergent near anterior ends. Propodus of first peraeopod less than twice as long as dactylus *longirostris* Sars.\*  
 Pseudorostral lobes not gaping above near apex of pseudorostrum. Propodus of first peraeopod more than twice as long as dactylus .. .. *nasutus* Zimmer.\*
3. Carapace with an open row of curved, laminate spines flanking the branchial regions *unguiculatus* Sars.\*  
 Carapace without these spines .. .. 4.
4. Carapace with short, stout, thorn-like spines on back and sides *erinuccus* Zimmer.  
 Carapace without such spines .. .. 5.

5. Uropod unusually short, its endopod not longer than telsonic somite and with distal spine stout and claw-like .. .. . *brevicaudatus* Calman.<sup>1</sup>  
Endopod of uropod longer than telsonic somite and with distal spine more slender .. .. . 6
6. First two pleon somites with strong, paired, dorso-lateral teeth .. .. . 7.  
First two pleon somites smooth dorsally, or with insignificant teeth .. .. . 8.
7. Including distal spine in the length of each ramus, the exopod of the uropod is only about one-third length of endopod .. .. . *suhmi* Sara.<sup>2</sup>  
Measured thus the exopod of uropod is more than half the length of endopod .. .. . *subinflatus* sp. nov.<sup>3</sup>
9. Pleural parts of free pedigerous somites with marginal laminar spines .. .. . 9.  
Pleural parts of free pedigerous somites without marginal laminar spines .. .. . 10.
9. First and second peraeopods with exopod .. .. . *aquatus* Calman.  
First and second peraeopods with no exopod .. .. . *turdus* Calman.
10. Peduncle of uropod longer than telsonic somite .. .. . 11.  
Peduncle of uropod shorter than telsonic somite .. .. . 13.
11. Eyes placed close together .. .. . *hirsutus* Hansen.  
Eyes separated by a wide interspace .. .. . 12.
12. Branchial siphons unusually long, more than half as long as carapace. Carapace with long scattered hairs. Peduncle of uropod half as long again as telsonic somite .. .. . *gurneyi* Calman.  
Branchial siphons short, only about as long as pseudorostrum. Carapace granulate. Peduncle of uropod only one-third as long again as telsonic somite .. .. . *sheardi* sp. nov.<sup>3</sup>
13. Endopod of uropod (not including distal spine) barely more than twice as long as peduncle, or shorter .. .. . 14.  
Endopod of uropod (not including distal spine) at least two and one-half times as long as peduncle .. .. . 17.
14. First and second peraeopods without exopods .. .. . *reptans* Calman.  
First and second peraeopods with exopods .. .. . 15.
15. Eyes placed close together. Peduncle of uropod not much shorter than endopod without its distal spine .. .. . *tima* (Hale).  
Eyes well separated. Peduncle of uropod only half as long as endopod without its distal spine .. .. . 16.
16. Carapace with a median dorsal depression between branchial regions. Terminal spine of exopod of uropod reaching nearly to distal end of endopod .. .. . *minor* Calman.  
Carapace with dorsum not sulcate between branchial regions. Terminal spine of exopod of uropod reaching barely beyond three-fourths of length of endopod .. .. . *johnstoni* sp. nov.<sup>1</sup>
17. Endopod of uropod with two to three short spines on inner margin .. .. . 18.  
Endopod of uropod with four to five short spines on inner margin .. .. . 20.
18. Terminal spine of endopod of uropod slender, more than half as long as the ramus .. .. . *sartori* Zimmer.<sup>1</sup>  
Terminal spine stouter, less than half as long as the ramus .. .. . 19.
19. Branchial regions greatly inflated. Carpus of fifth peraeopod shorter than propodus .. .. . *inflatus* sp. nov.<sup>3</sup>  
Branchial regions not strikingly inflated. Carpus of fifth peraeopod nearly half as long again as propodus .. .. . *simmeri* Calman.<sup>3</sup>
20. Terminal spine of exopod of uropod reaching nearly to distal end of endopod .. .. . *mystacinus* Zimmer.  
Terminal spine of exopod of uropod reaching to only four-fifths of length of endopod .. .. . *gibbosus* Calman.

## NANNASTACUS NASUTUS Zimmer.

*Nannastacus nasutus* Zimmer, 1914, p. 184, fig. 11-12.

Zimmer described the female from Western Australia. A species common in Moreton Bay, Queensland (L. S. R. Munro, various stations) seems to be referable here, although the size is smaller, an ovigerous female being only 1.65 mm. in length while the numerous males are about 1.8 mm.

In these males the pseudorostral lobes meet for a distance equal to somewhat less than one-fourth of the length of the carapace. The propodus of the first peraeopod is subequal in length to the carpus and is less than three times as long as dactylus, one of the terminal setae of which is very stout and is fully as long as its

joint. The propodus and dactylus of the second peraeopod do not differ much in length.

The carpus of the fifth peraeopod is less than half as long again as propodus.

The peduncle of the uropod is twice as long as the endopod or a little longer; the endopod bears about seven spines on the inner margin and its terminal spine is fully half as long as the ramus.

As in the male of *brachydactylus* Calman (1905, p. 14, fig. 3—female unknown) from seas north of Australia the eyes are placed close together; *nasutus* apparently differs in no important feature from Calman's species excepting that the peduncle of the uropod is relatively a little longer, and the endopod of that appendage carries a long instead of a very short spine.

*NANNASTACUS NASUTUS* var. *CAMELUS* Zimmer.

*Nannastacus nasutus* var. *camelus* Zimmer, 1914, p. 186, fig. 13; Hale, 1937, p. 73, fig. 9.

This variety was previously recorded from the female only. Males, from a number of South Australian localities, have the dorsal convexity posterior to the eyes not so prominent as in the female and, even so, varying somewhat in degree of development.

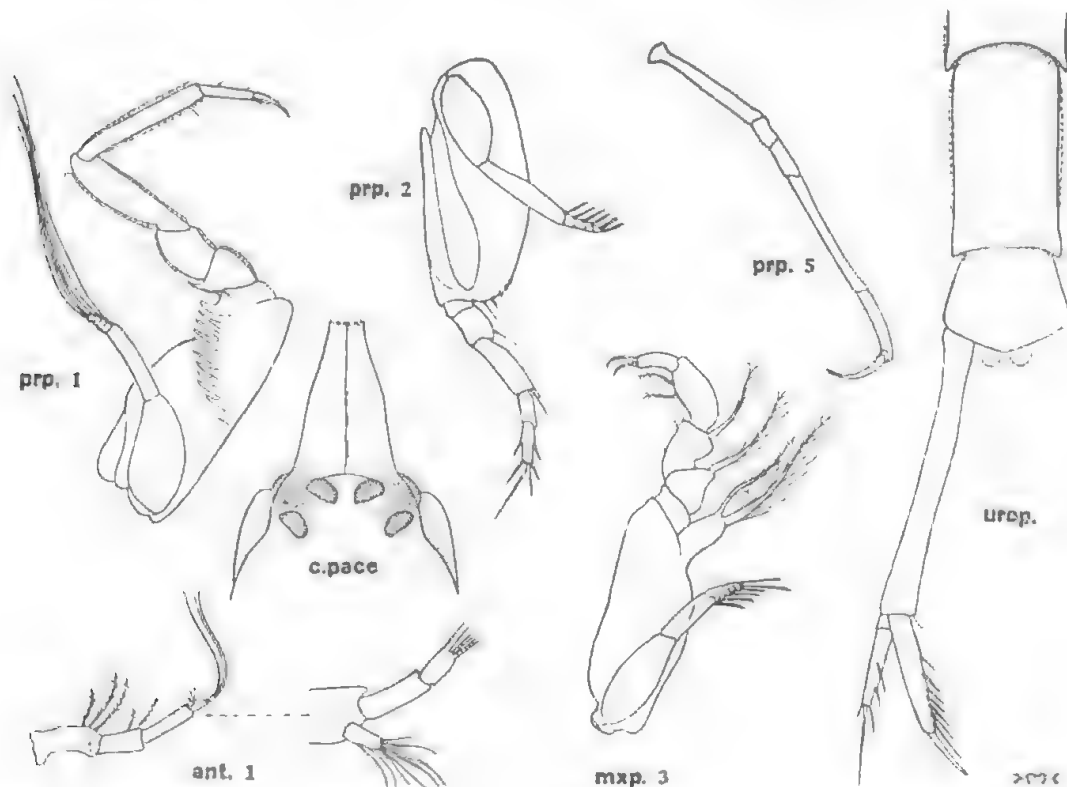


Fig. 1. *Nannastacus nasutus* var. *camelus*, adult male; c. pace, ocular lobe and pseudo-rostrum ( $\times 64$ ); ant. 1, first antenna ( $\times 74$ ; flagella,  $\times 270$ ); mxp. and prp., third maxilliped and peraeopods ( $\times 74$ ); urop., uropod with fifth pleon and telsonic somites ( $\times 74$ ).

*Adult male.* Pseudorostral lobes meeting for a distance equal to about one-fourth of total length of carapace, and with their anterior ends coarsely serrate; they meet for their whole length and do not diverge near apices; eyes each with three corneal lenses, the innermost separated from its opposite fellow by only about one-half the diameter of a lens; a low but distinct median carina runs from pseudorostrum to posterior margin of carapace.

First antenna with third joint of peduncle barely longer than second, and not much shorter than first; accessory flagellum single-jointed, relatively large, one-half the length of the first segment of the two-jointed main lash.

Basis of first pereopod with usual lamellate comb; not much more than two-thirds as long as rest of limb; ischium with a flattened spine at distal end of outer margin; carpus equal in length to propodus, which is two and one-half times as long as dactylus; the latter has a distal claw (as well as one or two slender setae) shorter than the joint.

Second pereopod with basis distinctly longer than rest of limb; ischium distinct; merus much shorter than carpus and as long as dactylus, which is not much longer than propodus; longest dactylar seta about as long as dactylus and propodus together.

Carpus of fifth pereopod more than three times as long as merus and almost twice as long as propodus, which is somewhat longer than dactylus.

Telsonic somite dilated posteriorly, where it is broader than long; fifth pleon somite narrow, twice as long as wide.

Uropod with peduncle smooth, two and three-fourths times as long as telsonic somite and distinctly more than twice as long as endopod; exopod three-fourths as long as endopod with terminal spine slender and reaching to tip of distal spine of endopod; on inner margin of endopod are three setae (one really distal) and at outer side of terminal bristle is a short seta; endopod with terminal spine stout, less than half as long as the ramus, and with seven very slender spines, successively increasing in length, on inner margin.

Colour milk white, without any dark pigmentation excepting on ocular lobe.

Length 2.5 mm.

While the Queensland examples of *nasutus* are smaller than the types, the South Australian specimens of the variety are larger; *nasutus camelus* has been taken only on the south coast, between long. 117° and 138°, about lat. 35° S, *nasutus* only above lat. 28° S., on both east and west coasts.

#### NANNASTACUS INCONSTANS sp. nov.

*Adult male* (cristate form). Carapace two-fifths of total length of animal, wider than greatest depth, which is more than half its length; its anterior portion and the moderately inflated branchial regions are studded with large granules, but near the inferior margin the surface is squamose-reticulate; dorsally there is a double row of tubercles, small anteriorly and posteriorly but for approximately the middle third of length of carapace high, flattened, distally dilated and crowded, producing the appearance of a pair of longitudinal crests; lateral to each row of large tubercles is a curved series of small tubercles; at hinder end of carapace is a median tumidity, granulate (as well as with the aforementioned rows of tiny tubercles) and feebly bilobed at the rear; behind each eye is a prominent tuberculate elevation, posterior to which and a little above its level, is a small rounded boss. Eyes widely separated, each with the usual three corneal lenses. Antero-lateral angle with small spiniform tubercles, none of which very definitely emphasizes the angle. Pseudorostral lobes widely gaping above but meeting below.

Pedigerous somites together barely more than half as long as carapace, the third and fourth unusually wide, as broad as the second and as the carapace; first exposed only as narrow strip; dorsally the first and second somites are short, but the back of the third to fifth is elevated and (like the pleural portions of second to fifth) strongly tuberculate; the tubercles on the pleurae of the fifth somite are elongate, almost spiniform.

Pleon about three-fourths as long as cephalothorax, granulate, the dorsum of each somite with two longitudinal rows of three or four larger tubercles, the last

of which is more prominent than the others; fifth somite little longer than fourth and not much longer than wide; telsonic somite a little longer than wide, posteriorly rather well produced above bases of uropods.

First peraeopod with basis two-thirds as long as remaining joints together; carpus only about one-tenth as long again as propodus and twice as long as dactylus, the longest distal seta of which is rather stout.

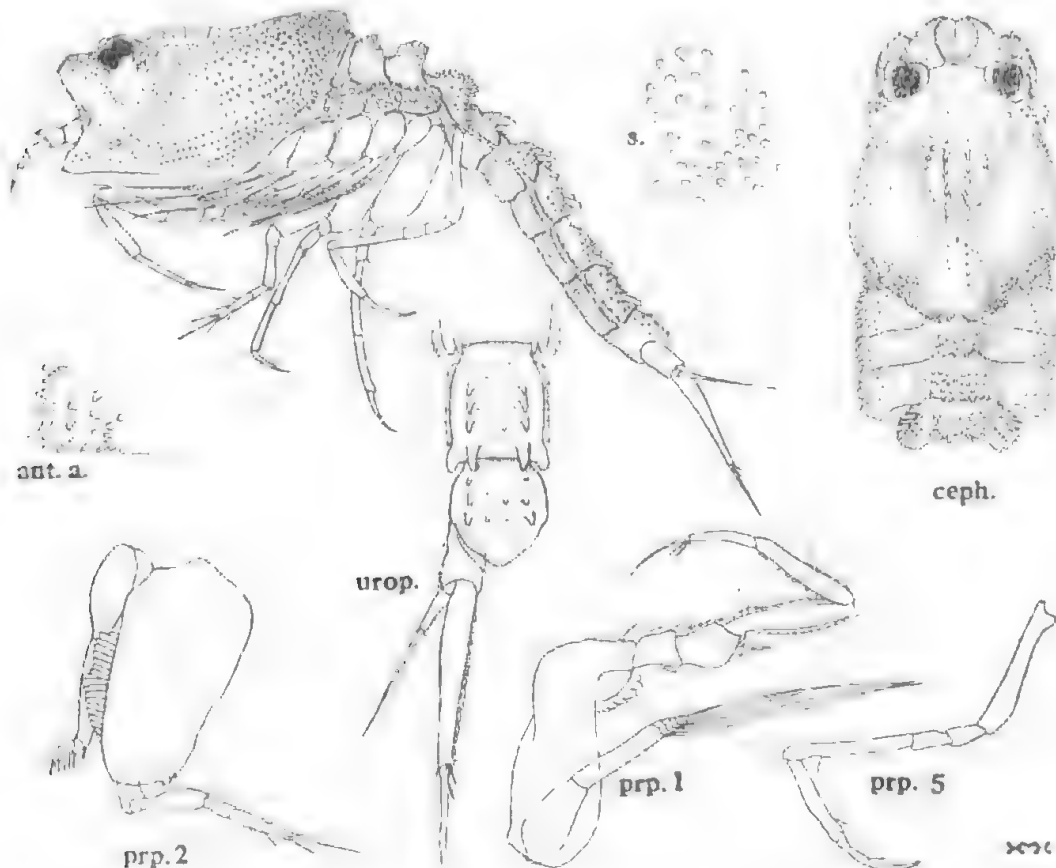


Fig. 2. *Nannastacus inconstans*, adult male, cristate form; lateral view and (ceph.) cephalothorax from above ( $\times 59$ ); s. and ant. a., sculpture of carapace over branchial region, and antero-lateral angle ( $\times 185$ ); prp., peraeopods ( $\times 95$ ); urop., uropod with fifth pleon and telsonic somites ( $\times 95$ ).

Second peraeopod with basis barely longer than rest of limb; ischium not distinctly made out; carpus twice as long as merus, which is barely longer than the elongate dactylus; the last-named is twice as long as propodus with its longest distal spine longer than the joint itself.

Posterior peraeopods long and slender; fifth pair fully as long as pleon with carpus about one-fourth as long again as propodus and more than three times as long as merus.

Peduncle of uropod less than two-thirds as long as telsonic somite and little more than one-third as long as endopod exclusive of its distal spine; exopod nearly one-third as long as endopod and with its terminal spine reaching to distal end of latter; endopod with two unequal spines at inner side of distal spine (which is more than half the length of the ramus) and with inner margin serrate for whole length but without articulated spines.

Length 1.35 mm.

Colour pale brown, the carapace margined with white in front and below.

*Loc.* South Australia: Backstairs Passage, Page Islands, 9 fath. (K. Sheard, submarine light, Apl., 1941). Types in South Australian Museum, Reg. No. C. 2614 and 2616.

*Adult male* (reticulate form). A male taken with that recorded above has so many features in common with it that there can be little doubt that it represents a different form of this sex in the same species. The pedigerous somites, pleon and the appendages are as described, excepting that the dorsal tubercles are somewhat more prominent and the endopod of the uropod is relatively a trifle shorter, although it is otherwise exactly similar, with the three unequal distal spines, serrated inner edge, etc. The sculpture of the carapace, however, is very different.

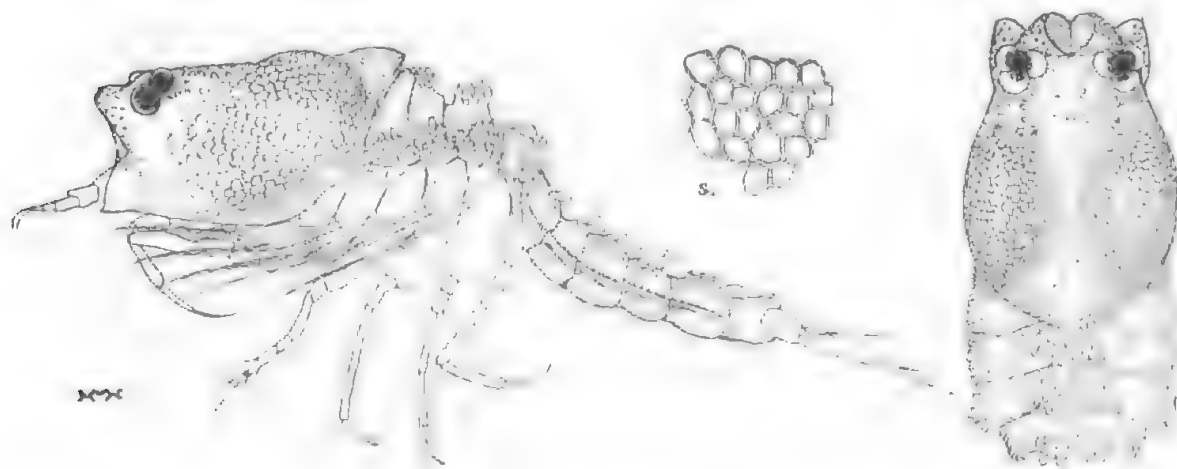


Fig. 3. *Nannastacus inconstans*, adult male, reticulate form; lateral view and cephalothorax from above ( $\times 59$ ); s., sculpture of integument over branchial region ( $\times 185$ ).

The branchial regions are more inflated and the surface of the integument here is marked with a distinct reticulate patterning (at S., fig. 2 and 3, the sculpture of the two varieties is to the same scale). There are no crests of tubercles on the dorsum, which bears scattered granules, vaguely arranged in longitudinal series behind the eyes, and there are no tumidities posterior to the eyes.

Length 1.35 mm.

This species is distinguished by the wide pedigerous somites and the armature of the pleon, plus the long posterior peraeopods and the character of the uropods.

#### NANNASTACUS CLAVATUS sp. nov.

*Adult male.* Integument of back and sides studded with large, distally dilated granules; a characteristic armature of dorsal tubercles on second to fifth pedigerous and first to fifth pleon somites; very sparse hairs.

Carapace distinctly more than one-third of total length of animal; it is less than twice as long as deep and not depressed, the width being equal to depth; seen from above it is suboval in shape, widest at about middle of length; dorsum as seen from the side almost evenly curved, except for a slight angularity in front of eyes. Antero-lateral margin shallowly concave; antero-lateral angle rounded and armed below with a single small tooth. Pseudorostral lobes meeting above and below for whole length; anteriorly they are subtruncate as seen from above, rounded and with a few teeth in lateral view.

First pedigerous somite shorter than second and partly concealed; second to fourth somites with pleural parts broadly expanded, granulate; on the back the second and third each bear a pair of curved, distally dilated, large tubercles, the



fourth has four such tubereles in a transverse row and the fifth a pair, closely followed by a row of four nearer its hinder margin.

First pleon somite with six large dorsal tubereles arranged as on last pedigerous; second and third somites each with two dorso-lateral tubereles on each side;

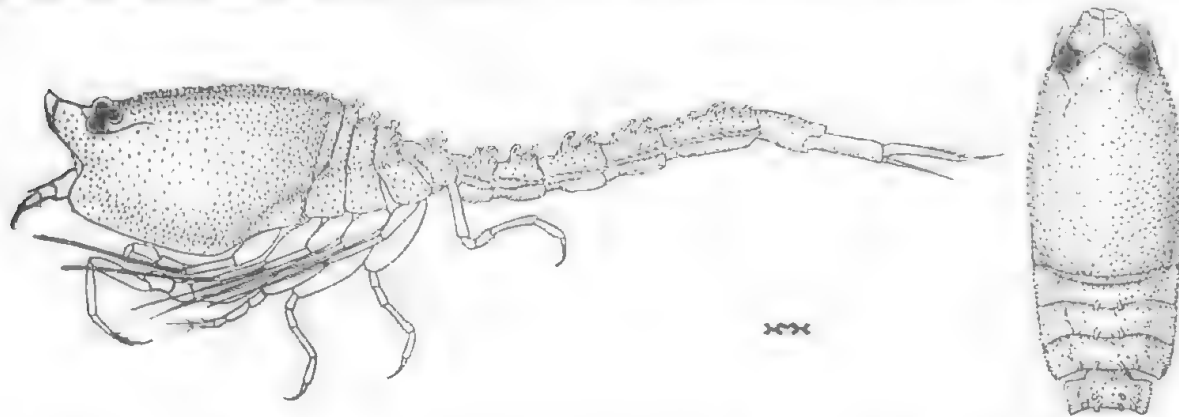


Fig. 4. *Nannastacus clavatus*, lateral view and dorsal view of cephalothorax of type male ( $\times 44$ ).

placed one behind the other, and scarcely dilated distally; fourth and fifth with three dorso-lateral tubereles on each side, the first smaller than the others on both somites; these are more like blunt spines and on the fifth somite the granules are themselves spine-like towards the rear; telsonic somite as long as wide, rounded posteriorly and with small acute projections, its dorsum with irregular granules but no large tubereles; fifth somite distinctly longer than the others, less than half as long again as broad.

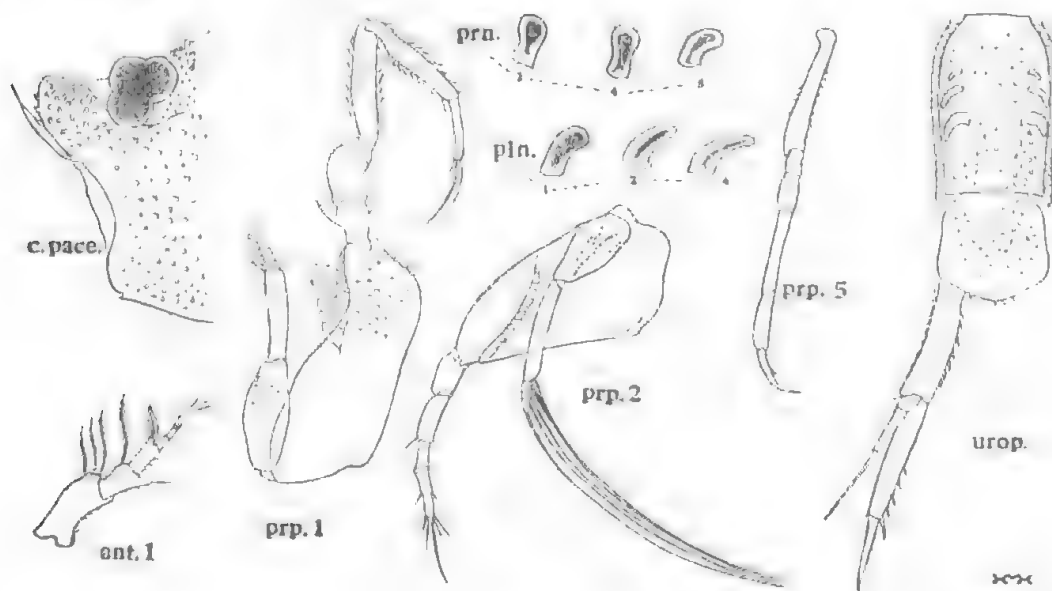


Fig. 5. *Nannastacus clavatus*, paratype male; c. pace, anterior portion of carapace ( $\times 86$ ); pra. and plu., large tubereles from back of pedigerous and pleon somites; ant. and prp., first antenna and peracopods ( $\times 86$ ); urop., uropod with fifth pleon and telsonic somites ( $\times 86$ ).

At pra. and plu. in fig. 5, tubereles from pedigerous somites 2, 4 and 5, and pleon somites 1, 2 and 4 show the gradual change from dilated to spiniform projections.

First joint of peduncle of first antenna twice as long as third which is shorter than second.

Propodus of third maxilliped distinctly longer than carpus and nearly twice as long as dactylus.

First peraeopod with basis less than two-thirds as long as rest of limb; propodus shorter than carpus, and almost twice as long as dactylus; the ischium has a strong spine on outer margin.

Second peraeopod two-thirds as long as first; basis less than half as long again as rest of limb; ischium indistinctly marked off; carpus only as long as dactylus, which is less than twice as long as propodus.

Carpus of fifth peraeopod nearly half as long again as propodus.

Peduncle of uropod a little longer than telsonic somite and not much shorter than endopod exclusive of its terminal spine; it is serrate on both edges; exopod slightly more than half as long as endopod and with its terminal spine reaching beyond distal end of latter; endopod with five spines on inner margin (including sub-distal one), which successively increase in length backwards, and with distal spine stout, distinctly more than half as long as its ramus and almost as long as the more slender spine of the exopod.

Colour yellowish-white.

Length 1.9 mm.

*Loc.* South Australia: Backstairs Passage, Page Islands, 9 fath. (K. Sheard, submarine light, Apl., 1941). Type male in South Australian Museum, Reg. No. C. 2604.

The situation in which this species was taken is rough, the islands being almost incessantly pounded by heavy seas, rendering collecting difficult excepting under unusually favourable circumstances.

#### NANNASTACUS ASPER sp. nov.

*Nannastacus hansenii* Hale (*nee* Calman), 1936, p. 431.

*Adult male.* Integument of back and sides with spiniform tubercles, becoming sparser on telsonic somite.

Carapace barely more than one-third of total length of animal, depressed, a little less than twice as long as deep, and twice as long as the pedigerous somites together; antero-lateral and branchial regions swollen and a posterior median tumidity; spiny armature conspicuous and close-set but no outstanding larger spines. Antero-lateral margin deeply and rather angularly concave; antero-lateral angle produced to form an acute spine, and lower border of carapace posterior to it margined with spinules. Pseudorostral lobes subtriangular, separated both above and below, distally acute when viewed from above and from the side rounded.

First pedigerous somite not visible behind carapace; second and third somites each with a pair of prominent spines on back; fourth with no large dorsal spines and fifth with a pair of low, stout elevations, each capped with a large and some smaller spines; pleural parts expanded and backwardly produced, spinose like sides.

First three pleon somites with paired dorsal elevations and spines as on last pedigerous somite; back of fourth less raised but with one pair of spines more prominent than the others; fifth distinctly longer than any of the others and about half as long again as wide, with no elevations on back but with one pair of spines at hinder end somewhat longer than the others; telsonic somite fully as wide as long, broadest behind middle of length, produced posteriorly and angularly rounded.

Third joint of peduncle of first antenna subequal in length to second and half as long as first.

Propodus of third maxilliped longer than carpus.

Basis of first three pairs of pereopods with comb of lamellate spines.

First pereopod with basis more than two-thirds as long as rest of limb; propodus subequal in length to carpus (not longer than it) and distinctly less than twice as long as dactylus.

Second pereopod two-thirds as long as first; basis half as long again as rest of limb; carpus half as long again as merus and a little longer than propodus and dactylus together.

Carpus of fifth pereopod less than one and one-fourth times propodus.

Peduncle of uropod about five-sixths as long as telsonic somite and much more than one-third as long as endopod exclusive of its terminal spine; exopod less than one-tenth as long as endopod and with its terminal spine not reaching to middle of length of latter; endopod with six short spines on inner margin and with distal spine only one-fourth as long as its ramus.

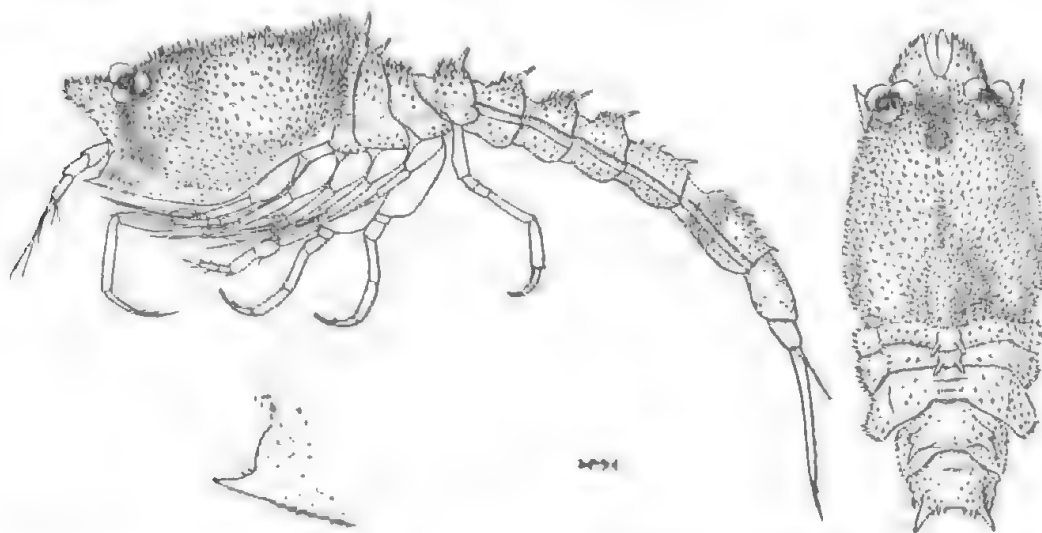


Fig. 6. *Nannastacus asper*, type male; lateral view and cephalothorax from above ( $\times 37$ ); antero-lateral angle of carapace ( $\times 72$ ).

Colour, yellowish white, with a dark marking between eyes and a conspicuous blackish band across anterior part of sides of carapace, but not including pseudorostrum and not extending quite to antero-lateral margin, leaving a whitish edging. Fifth pleon somite with a dark band on anterior half.

Length 2.3 mm.

*Loc.* South Australia: St. Vincent Gulf, Sellick's Reef, etc.; Spencer Gulf, Western Shoal (K. Sheard, tow-net, Feb., 1938), and Memory Cove, 3 fath., (type loc., K. Sheard, submarine light, Feb., 1941), etc. Tasmania: Cape Barren Island (D. L. Serventy, tow-net, Nov., 1939). Type in South Australian Museum, Reg. No. C. 2573.

The dark colour markings are characteristic but in a few examples are rather faint and the blotch between the eyes is almost or quite absent. The spiny armature is a little more prominent in some examples than in others.

Two males of this species were previously referred to Calman's *hanseni* (1905, p. 11, fig. 1) with which they agree in having the pseudorostral lobes divergent both above and below, in having the back of the pleon prominently spiny, etc. After examination of many more males (no females have been taken as yet) the Southern Australian species is separated because *hanseni* differs from it in the following particulars (1) the carapace is covered with rounded, not spiniform, tubercles, its median hinder tumidity is bilobed, and its antero-lateral angle is not produced as

a spine; (2) the pleon has the dorsal elevations higher and more slender while the fifth somite (like that of the related *ossiana* Stebbing, 1900, p. 612, pl. lxiv A) is not noticeably longer than any of the others; (3) the uropods are shorter and the carpus of the fifth legs relatively longer.

*N. crinaceus* Zimmer (1913, p. 450, pl. iv, fig. 36-37), has the carapace prickly as in *asper* but the thorn-like armature is differently arranged, while a pair of spines between the eyes are prominent, and there is a spine on each eye; the uropods of Zimmer's single female, from South Africa, are damaged.

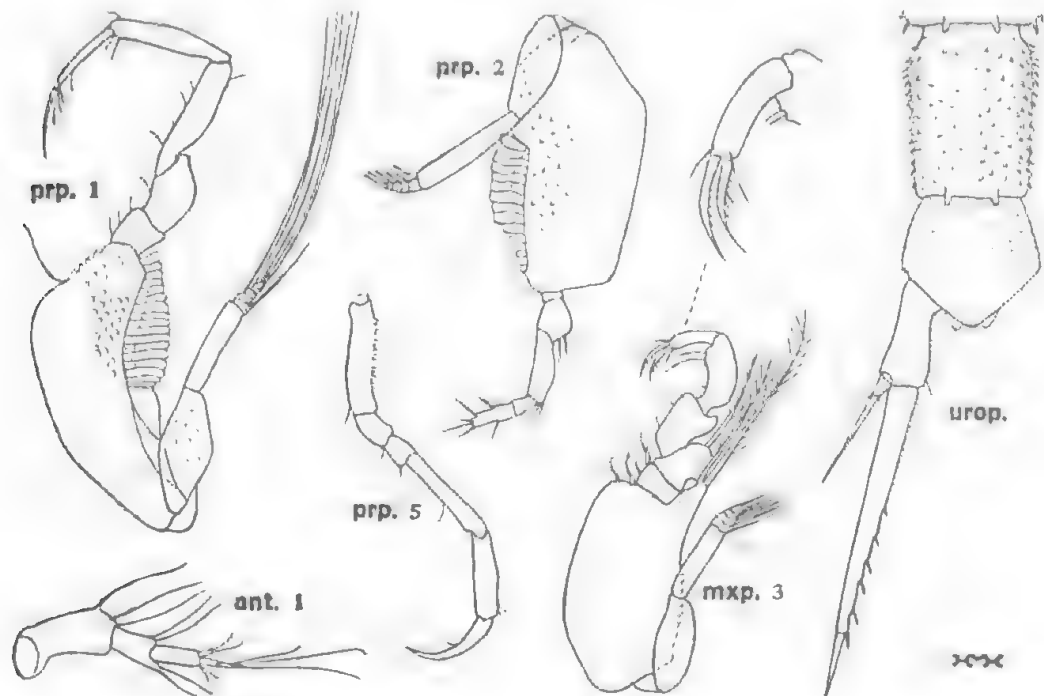


Fig. 7. *Nannastacus asper*, paratype male; ant., mxp. and prp., first antenna, third maxilliped and paracopods ( $\times 70$ ; dactylus of maxilliped,  $\times 156$ ); urop., uropod with fifth pleon and telsonic somites ( $\times 70$ ).

#### NANNASTACUS SHEARDI sp. nov.

*Cumella lima* Hale (male only), 1936, p. 436, fig. 23, h and i.

*Ovigerous female.* Back and sides studded with small granules, none of which is enlarged or outstanding; a few scattered hairs are present.

Carapace one-third of total length; its greatest width, at the rear, is a little greater than its depth, and equal to three-fourths its length; there is a very fine but distinct median dorsal carina; seen from the side the dorsum is elevated at posterior end and the pseudorostrum is directed obliquely upwards. Antero-lateral margin not deeply concave; antero-lateral angle and margin behind it serrate (fig. 8, c. pace). Pseudorostral lobes meeting for whole length; both from above and from the side they are truncate and serrate in front.

First pedigerous somite fully exposed, with its pleural parts, like those of second and third somites, markedly expanded laterally, but not backwards; the fifth is somewhat tumid dorsally. Seen from above the whole cephalothorax is ovoid.

First and second pleon somites with dorsum slightly more tumid than in others; fifth somite much longer than any of the others, distinctly more than

twice as long as wide; telsonic somite dilated at distal end, rounded posteriorly but longer than width here.

Second and third joints of peduncle of first antenna equal in length, each less than half length of first.

Third maxilliped with exopod.

First peraeopod with propodus subequal in length to carpus and twice as long as dactylus.

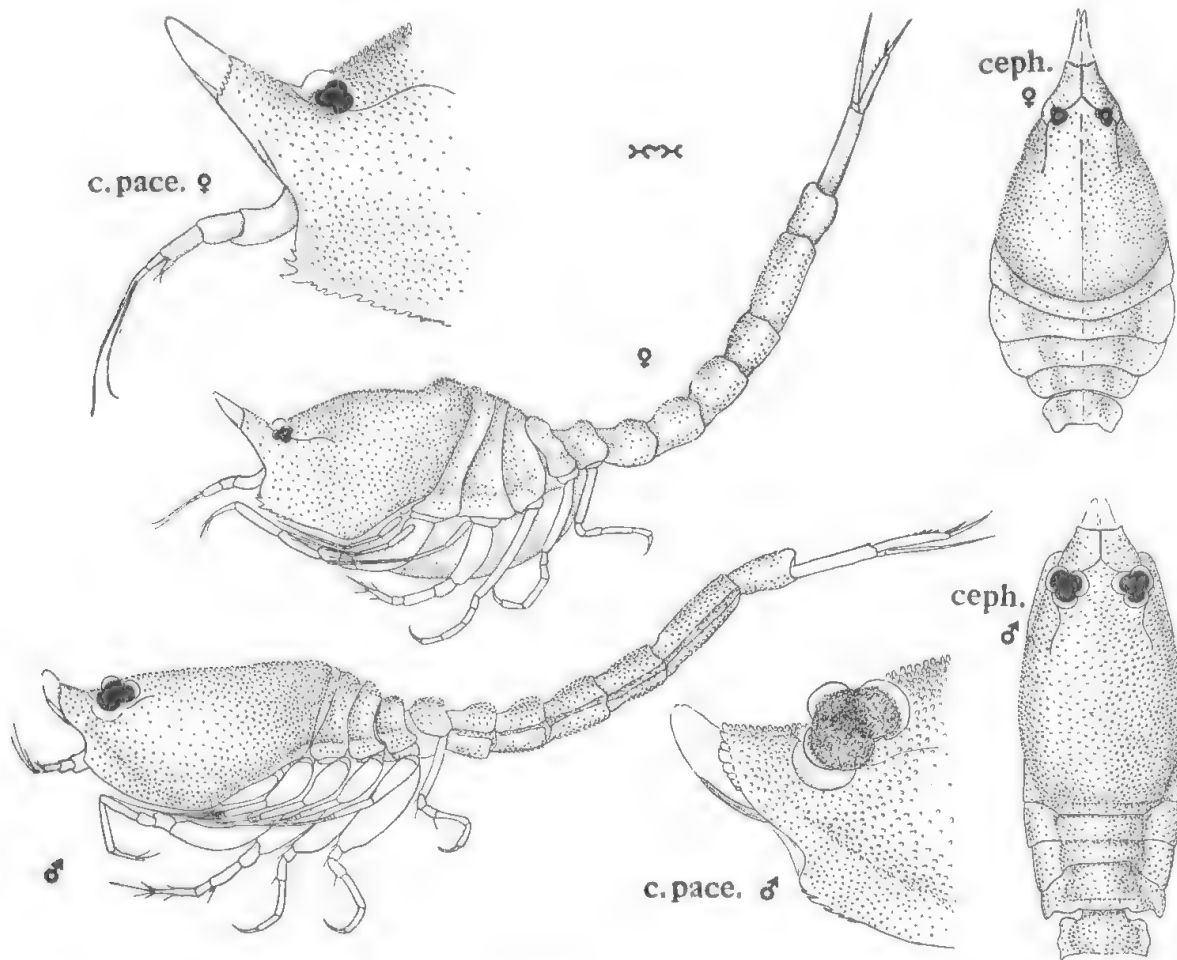


Fig. 8. *Nannastacus sheardi*, type female and paratype male; lateral view and (ceph.) cephalothorax from above ( $\times 52$ ); c. pace, anterior portion of carapace ( $\times 115$ ).

Second peraeopod two-thirds as long as first; basis four-fifths as long as rest of limb; ischium not distinctly marked off; carpus half as long again as merus but not as long as propodus and dactylus together; longest distal spine of dactylus longer than the joint.

Carpus of fifth peraeopod two-thirds as long again as propodus, which is equal in length to dactylus.

Peduncle of uropod one-third as long again as telsonic somite and nearly one-third as long again as endopod without terminal spine; exopod more than three-fourths as long as endopod, with its distal spine reaching not far short of the tip of the spine of the endopod; endopod with four spines on inner margin (the subdistal one much longer than the others) and with terminal spine more than two-thirds length of ramus and six-sevenths the length of exopodal spine.

Length 1.5 mm.

Colour, pale orange, with a dark irregular brown band across anterior part of carapace.

*Adult male* Granulation of integument a little more pronounced than in female.

Carapace more than one-third of total length, slightly depressed and twice as long as deep; from the side the dorsum is almost evenly rounded, scarcely elevated posteriorly, and the pseudorostrum does not form a decided angle as in the female. Antennal angle less prominent, the margin behind it serrate.

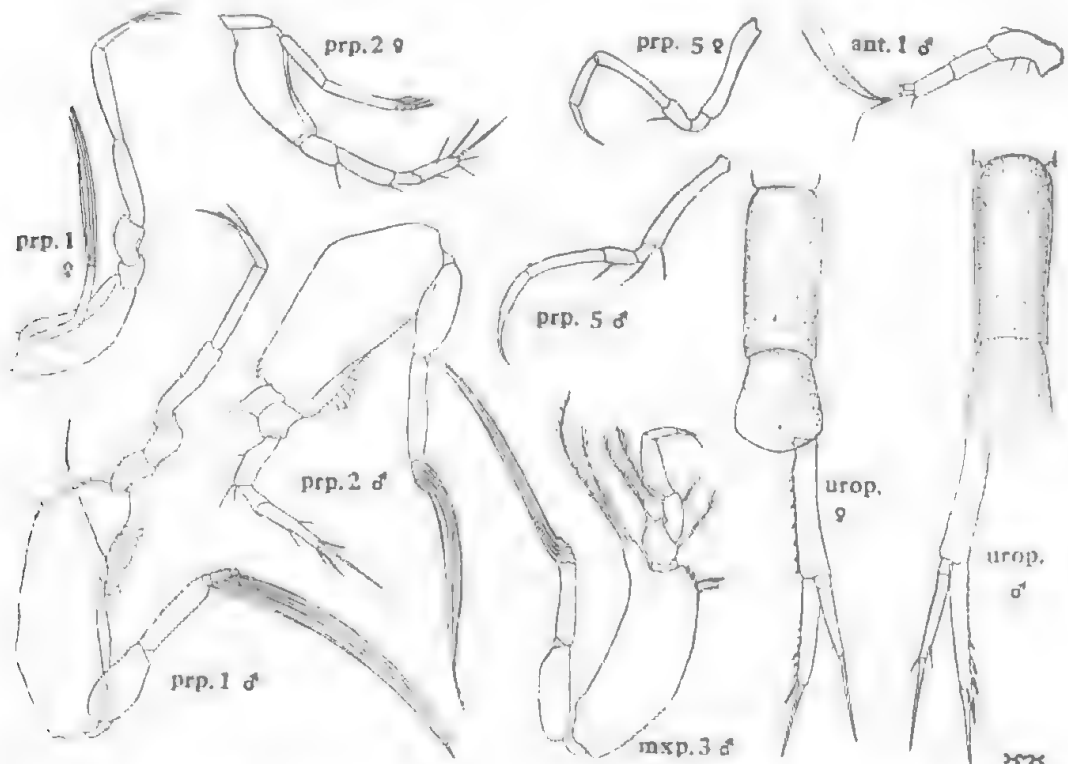


Fig. 9. *Nannastacus sheardi*, type female and paratype male; ant., mxp. and prp., first antenna, third maxilliped and pereopods; urop., uropods with fifth pleon and telsonic somites (all  $\times 86$ ).

First pedigerous somite short, its pleural parts concealed. Fifth pleon and telsonic somites resembling those of female.

Pereopods (apart from sexual differences) much as in female but the second is three-fourths as long as the first and has the dactylus longer, the carpus being shorter than it.

Peduncle of uropod more than one-third as long again as telsonic somite but only about one-sixth longer than endopod, the rami being a little longer than in female; exopod four-fifths as long as endopod without distal spine; endopod with four spines (preceded as in female by tiny spinules) on inner margin, the sub-terminal almost half as long as terminal, which is less than two-thirds the ramus and shorter than exopodal spine.

Length 1.59 mm.

*Loc* South Australia: St. Vincent Gulf, Brighton, on shingle bar (type female, K. Sheard and B. C. Cotton, Mar., 1937); Wardang Island, 2 fath. (K. Sheard, submarine light, Feb., 1941); Sir Joseph Banks Group, on reef of gneiss rocks (B. C. Cotton, Dec., 1936). Types in South Australian Museum, Reg. No. C. 2607-2609.

When describing *lima*, the author recorded as that species a male which was associated with the females; the differences in the uropods were noted. Since then a small series of identical males was taken by submarine light, while also available is the female of *sheardi* recorded above, and other females from the Joseph Banks group; a comparison of the appendages (particularly the uropod) and fifth pleon and telsonic somites of the females with those of the males in question (cf. urop., fig. 9) leaves little doubt as to their relationship. (See also note under *lima* herein).

The females collected by Mr. Cotton have the granulation pronounced, the granules elongate.

*V. gurneyi* Calman (1927, p. 400, text fig. 101; female only, Gulf of Suez) is very like *sheardi* but is distinguished by the long rostral siphous, the different proportions of the uropods, etc.

#### NANNASTACUS INFLATUS sp. nov.

*Nannastacus gibbosus* Hale (*nec* Calman), 1936, p. 432.

*Nannastacus zimmeri* Hale (*part.*, *nec* Calman), 1936, p. 432.

*Ovigerous female.* Integument of back and sides with numerous small, glassy, distally dilated granules, closely beset on the carapace; with sparse hairy clothing.

Carpapace more than one-third of total length; its greatest width is much greater than its depth and more than three-fourths its length; seen from above it is widest across the branchial regions which are much inflated, with a distinct median gutter between; there is a decided but smaller tumidity on each side anteriorly and a still smaller dorsal pair of low bosses behind the eyes; posteriorly there is a rounded median elevation, with its hinder end rather acute and backwardly produced; seen from the side these tumidities result in a very uneven dorsal outline and there is a decided angle at the base of the pseudorostrum. Antero-lateral margin deeply concave and antero-lateral angle bifid, being produced as an acute tooth, above which is a smaller tooth. Pseudorostral lobes gaping above and below; seen from the side they are subtruncate in front and coarsely serrate.

Pleural parts and a narrow strip of first pedigerous somite exposed; the dorsum of the second somite is somewhat elevated and capped with conspicuous tubercles; the fourth somite has a dorsal tumidity, divided by a longitudinal furrow and topped with large tubercles; the pleural parts are rounded and considerably expanded, the third somite being as wide as the carapace.

First pleon somite with dorsal prominence as on last pedigerous; fifth distinctly longer than any of the others, less than half as long again as wide, slightly swollen laterally just behind middle of length, and with a pair of conical dorsal tubercles at hinder margin, larger than the general surface tubercles; telsonic somite as wide as long, rounded posteriorly and broadest in distal half.

Third joint of peduncle of first antenna a little shorter than second and half as long as first.

Third maxilliped with no exopod; carpus and propodus equal in length.

First peraeopod with propodus a little longer than carpus and almost twice as long as dactylus.

Second peraeopod two-thirds as long as first; basis as long as rest of limb, carpus longer than ischium and merus together, and as long as propodus and dactylus together.

Carpus of fifth peraeopod shorter than propodus, which is barely longer than dactylus.

Peduncle of uropod fully three-fourths as long as telsonic somite and little more than one-third as long as endopod, exclusive of its distal spine; exopod less

than one-tenth as long as endopod and with its terminal spine reaching just beyond three-fifths of length of latter; endopod with three short spines on inner margin and with terminal spine less than half the length of ramus.

Length 1.9 mm.

*Adult male.* Integument with granules not quite so prominent as in female.

Carapace a little more than one-third total length of animal, depressed, twice as long as deep and with tumidities as in adult female, although the branchial regions are never inflated to a like degree (cf. ceph., fig. 10). Antero-lateral angle

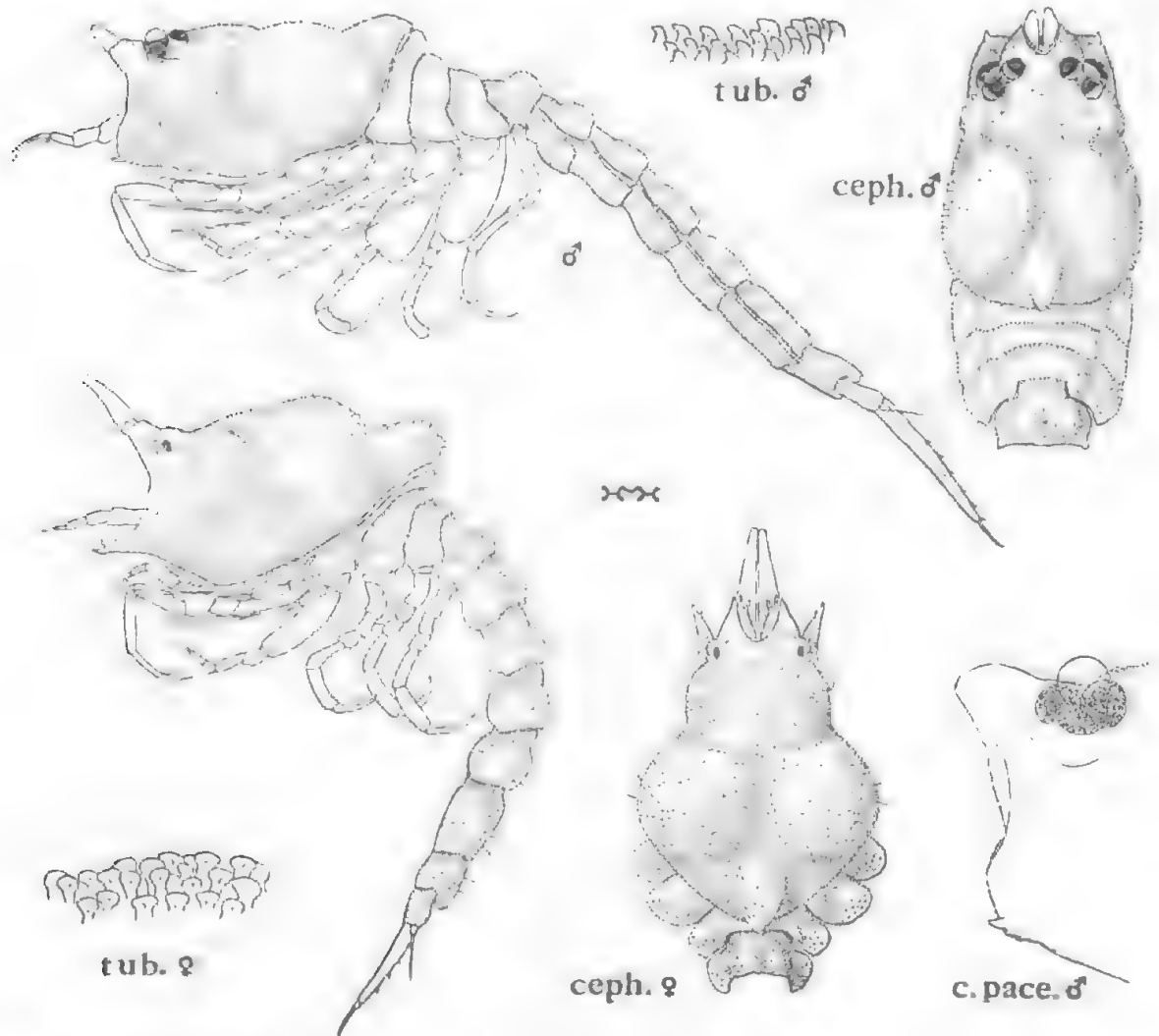


Fig. 10 *Nannastacus inflatus*, types adult male and ovigerous female; lateral views and (ceph.) cephalothorax from above ( $\times 43$ ); c. pace, anterior portion of carapace ( $\times 86$ ); tub., tubercles on back of carapace ( $\times 240$ ).

obtuse but actual corner produced as a spine, behind which the margin is serrate. Pseudorostral lobes not meeting above or below; oblique and crenulate in front as seen from the side. Eyes large and prominent, more so than in female.

First pedigerous somite exposed as narrow strip only. Dorsal elevations on last pedigerous and first pleon somites just as in female.

Basis of third maxilliped longer than rest of limb.

Basis of first pereopod two-thirds as long as remaining joints, the proportions of which are as in female.

Carpus of fifth pereopod about one-fourth as long again as propodus.



Peduncle of uropod about as long as telsonic somite and a little more than one-third as long as endopod exclusive of its distal spine; exopod one-fifteenth as long as endopod and with its terminal spine reaching just beyond two-fifths of length

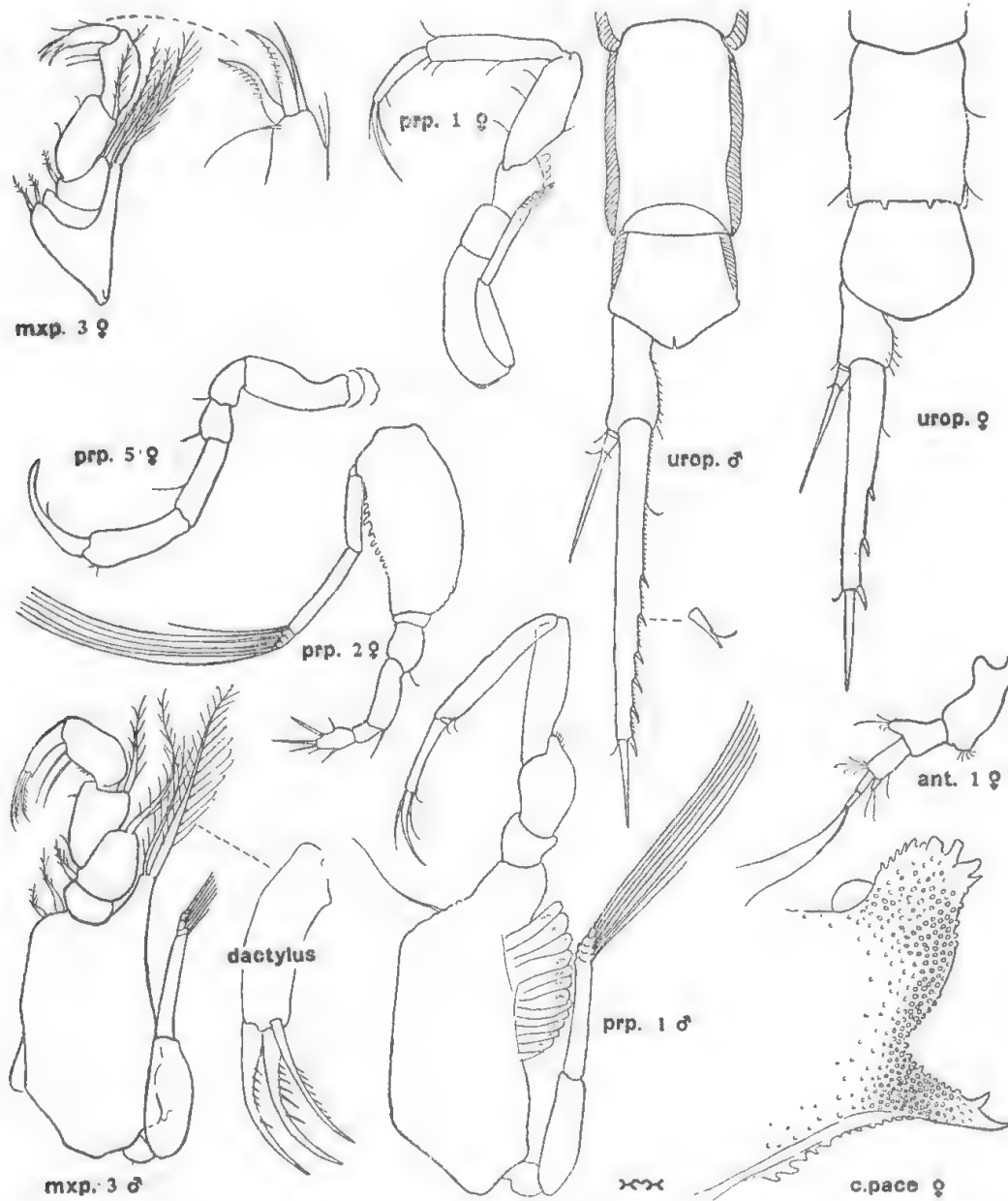


Fig. 11. *Nannastacus inflatus*, type male and paratype ovigerous female; c. pace, anterior portion of carapace, somewhat flattened; ant., mxp. and prp., first antenna, third maxillipeds and pereopods; urop., uropods with fifth pleon and telsonic somites ( $\times 164$ ; dactyli of maxillipeds,  $\times 270$ ).

of latter; endopod with six short spines on inner margin and with terminal spine two-sevenths as long as its ramus.

Length 2.1 mm.

Colour (both sexes). Yellow shaded with pale brown, with scattered dark brown spots on carapace, and a few prominent blotches on legs. The most constant marking is a dark brown band, sometimes interrupted dorsally, on the fifth pleon somite.

*Loc.* South Australia: St. Vincent Gulf, Sellick's Reef, 1 fath., on stones (H. M. Hale, Jan. and Apl., 1936) and off Brighton jetty (Miss P. Mawson, Miss L. M. Angel and K. Sheard, submarine light, Oct., 1941) and Rapid Bay, 4 fath., on mud (H. M. Cooper and A. Rau, Jan., 1944); Pongalowie Bay (K. Sheard, tow-net, Mar., 1938); Kangaroo Island, Antechamber Bay (K. Sheard, submarine light, Dec., 1939); Spencer Gulf, Corney Point (K. Sheard, Feb., 1941) and Port Lincoln and Memory Cove, 3 fath. (type loc., K. Sheard, submarine light, Feb. 1941). Queensland: Moreton Bay, Myora Bight, surface (ovigerous female, I. S. R. Munro, Station 42, 50 cm. 40 m., net, 7 p.m., Nov. 29, 1940 and males from other stations in the Bay, Nov.-Dec., 1940). Types in South Australian Museum, Reg. No. C. 2577-2578.

This appears to be the commonest *Nannastacus* of the South Australian coast. Ovigerous females and juveniles were previously referred to *gibbosus* by the writer. Calman's species is described from the adult female only and this is separated from that of *inflatus* by having (1) the pseudorostral lobes meeting below; (2) the third joint of peduncle of first antenna longer than the second; (3) the exopod of the uropod, with its spine, relatively longer, while the endopod has "five small spines on its inner edge." Also, Calman does not figure the two dorsal tubercles at hinder margin of the fifth pleon somite but the non-articulated spines of the integument show some variation in *inflatus*.

The adult males of *inflatus* are of two sizes, approximately 2.1 mm. and 2.2 mm. in length. The larger males were regarded *ad supra* as *zimmeri* Calman but the male of the last-named differs (1) in the smaller size, 1.6 mm.; (2) the pseudorostral lobes are not widely open above; (3) the carpus of the fifth pereopod is half as long again as the propodus; (4) the exopod of the uropod with its spine is longer, reaching beyond middle of length of endopod.

*N. inflatus* also has affinities with the smaller *sauteri* Zimmer (1921, p. 135, fig. 30-37) but is separated by the characters given in the keys.

The single female from Queensland is 2.1 mm. in length but the largest of the males taken by Mr. Munro measure over 2.5 mm.; these males have the uropods and other appendages as in the southern specimens but the furrows between the tumidities of the carapace are less pronounced, a feature possibly produced by four years of immersion in formalin.

#### NANNASTACUS SUBINFLATUS sp. nov.

*Nannastacus zimmeri* Hale (*part., nec* Calman) 1936, p. 432.

*Ovigerous female.* Integument with granules as in *inflatus* and with sparse, rather long hairs.

Carapace large, fully two-fifths of total length; it is widest across the branchial regions, where the breadth is considerably greater than its depth and is equal to four-fifths its length; although each branchial region is inflated there is no deep furrow between the swellings as in *inflatus*, nor, viewed from above, is there a marked constriction anterior to them; posteriorly is a median tumidity, not prominent as seen from the side, and having at its hinder end a pair of tubercles larger than the general granules. Antero-lateral margin deeply concave and angle produced, tooth like. Pseudorostral lobes as in *inflatus* but a little shorter; not meeting above or below.

Pleural parts and lower part of sides of first pedigerous somite exposed: dorsal tumidity of fifth with a pair of tooth-like tubercles, which stand out amongst the smaller granules; first to third somites as wide as carapace, the pleural parts being considerably expanded but not backwardly produced.

First and second pleon somites with dorsum slightly elevated, each with a pair of acute tubercles as on last pedigerous somite; fifth distinctly longer than

any of the others, less than half as long again as wide; telsonic somite as wide as long, slightly dilated towards posterior end which is roundly sinuate.

First antenna as in *inflatus*.

Third maxilliped without exopod; ischium relatively large and distinct.

First peraeopod with propodus not longer than carpus and much less than twice as long as dactylus.

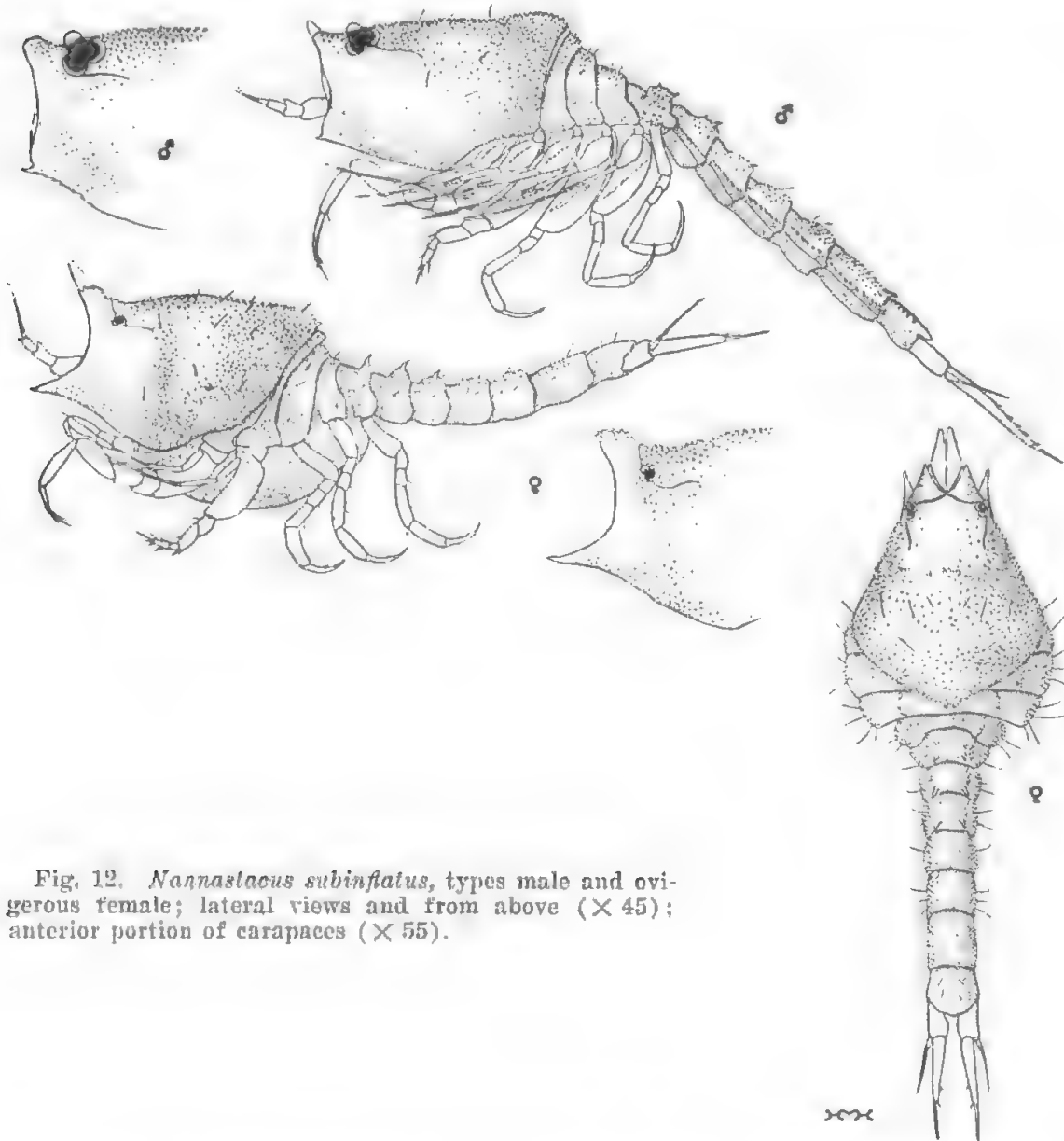


Fig. 12. *Nannastacus subinflatus*, types male and ovigerous female; lateral views and from above ( $\times 45$ ); anterior portion of carapaces ( $\times 55$ ).

Carpus of fifth peraeopod a little longer than propodus (shorter than it is in *inflatus*).

Peduncle of uropod more than three-fourths as long as telsonic somite and fully half as long as endopod, exclusive of its distal spine; exopod almost one-sixth as long as endopod and with its terminal spine reaching almost to five-sixths of length of latter; endopod with two short spines on inner margin and with its distal spine more than half the length of the ramus.

Colour dull yellow.

Length 1.4 mm. (ova in greatest diameter 0.18 mm.).

*Adult male.* As in the female there are paired spiniform tubercles on the back of the last pedigerous and first two pleon somites, while the terminal joints of the pereopods are of the same proportions. Carapace fully one-third of total length of animal, less inflated than in male of *inflatus* and with dorsal outline more regular. Antero-lateral angle and pseudorostral lobes much as in *inflatus*.

Only a narrow strip of first pedigerous somite exposed.

Upper margin of antennal groove of first to fifth pleon somites quite strongly spinose; fifth somite more than half as long again as wide, with a pair of spiniform tubercles at hinder margin; telsonic somite slightly longer than wide.

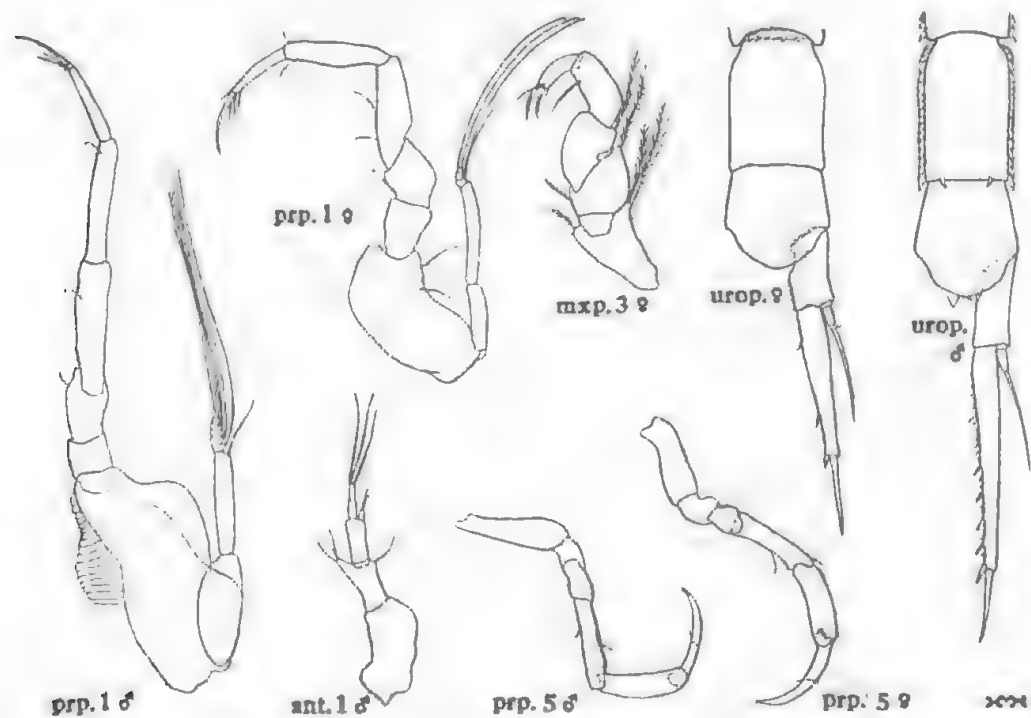


Fig. 13. *Nannastacus subinflatus*, paratypes male and ovigerous female; ant., mxp. and prp., first antenna, third maxilliped and pereopods; urop., uropods with fifth pleon and telsonic somites (all  $\times 86$ ).

Peduncle of uropod more than three-fourths as long as telsonic somite, and two and one-half times in length of endopod, exclusive of its terminal spine; exopod about one-eighth as long as endopod and with its distal spine reaching distinctly beyond middle of length of latter; endopod with five short spines on inner margin and with terminal spine one-third as long as its ramus.

Length 1.7 mm.

*Loc.* South Australia: St. Vincent Gulf, Sellick's Reef, on stones, 1 fath. (H. M. Hale, Apl., 1936) and off Brighton jetty (type male, Misses P. Mawson and L. M. Angel, submarine light, Oct., 1941) and Port Willunga, on reef (type female, Hale, Apl., 1944); Spencer Gulf, Memory Cove, 3 fath. (K. Sheard, submarine light, Feb. 1944) and other localities in both Gulfs. Types in South Australian Museum, Reg. No. C. 2588 and C. 2612.

The smaller males previously identified by the writer as *zimmeri* Calman are referred here. *N. subinflatus* is very like Calman's species but the last-named differs in having the pseudorostral lobes meeting below, and in the male for a short distance above also, the pleon is without spines, while the carpus of the fifth leg is

nearly half as long again as the propodus, and the endopod of the uropod is three times as long as the peduncle; as these differences are constant in a long series of South Australian specimens the latter are now regarded as representative of a distinct species.

*N. subinflatus* occurs in the same situations as *inflatus*; it may be distinguished by the smaller size, the different shape of the carapace and the proportions of the peraeopods and uropods; it will be noted that the inner margin of the endopod of the last-named (as in *zimmeri*) bears two short spines in the female and five in the male as against three and six in the sexes of *inflatus* and *johnstoni*.

#### NANNASTACUS LIMA (Hale).

*Cumella lima* Hale (female only), 1936, p. 435, fig. 22 and fig. 23, a-g.

Although the eyes are much closer together than is usual in the females of species of *Nannastacus*, they are paired; each has three corneal lenses and is separated from its fellow by a distance less than its breadth. The larger eyes of the males of *brachydactylus* Calman and *nasutus* Zimmer are similarly narrowly separated.

An ovigerous female recently collected in Table Bay, Tasmania, has the form slightly more robust than in South Australian examples, is a trifle smaller (1.3 mm.) and the granulation of the integument is quite distinct. The antero-lateral corner of the carapace is subacute and the lower margin immediately posterior to it is serrate. The third maxilliped has an exopod. The peraeopods are much as described for *sheardi* but the carpus of the fifth peraeopod is less than half as long again as the propodus.

A few subadult males from Tasmania have the uropods as in the female excepting that exopod and peduncle are very slightly longer in relation to the endopod, which has three distal spines distinctly marked off on inner margin. The fifth pleon somite, as in the female, is only half as long again as wide.

#### NANNASTACUS JOHNSTONI sp. nov.

*Ovigerous female.* Integument almost smooth, shining, sparsely clothed with long hairs.

Carapace relatively large and robust, three-sevenths of total length of animal and nearly three times as long as pedigerous somites together; across the inflated branchial regions it is wider than deep, while it is less than twice as long as deep; the antero-lateral regions are somewhat swollen, there being a noticeable lateral depression between these tumidities and the swollen branchial areas; back of carapace rather flat, slightly rounded along midline and with a median tumidity at hinder end. Antero-lateral margin angularly concave and antero-lateral angle well marked, produced and subacute. Pseudorostrum directed upwards, the lobes gaping above and below, and not meeting to any appreciable extent; front of lobes as seen from side rounded and subtruncate, with indefinite serrations.

Pleural parts and a narrow strip only of first pedigerous somite exposed; second also very short dorsally (where it is elevated) but like first and third greatly expanded laterally and wider than the carapace; fourth and fifth somites each with back slightly raised.

Pleon somites short and stout; first deeper and wider than long, with dorsum tumid; fifth longer than the others, but less than half as long again as wide; telsonic somite rounded posteriorly, barely longer than wide.

Third joint of peduncle of first antenna shorter than second and less than half as long as first.

Third maxilliped without exopod and with ischium poorly defined; propodus a little longer than carpus.

First peraeopod with basis very short, much less than half as long as the elongate remainder of limb; propodus little longer than carpus and less than twice as long as dactylus.

Second peraeopod two-thirds as long as first; basis subequal in length to rest of limb; carpus not much longer than merus, and about as long as propodus and dactylus together; dactylus short and broad, little longer than propodus, and shorter than its longest distal spine.

Carpus of fifth peraeopod shorter than propodus, which is longer than dactylus.

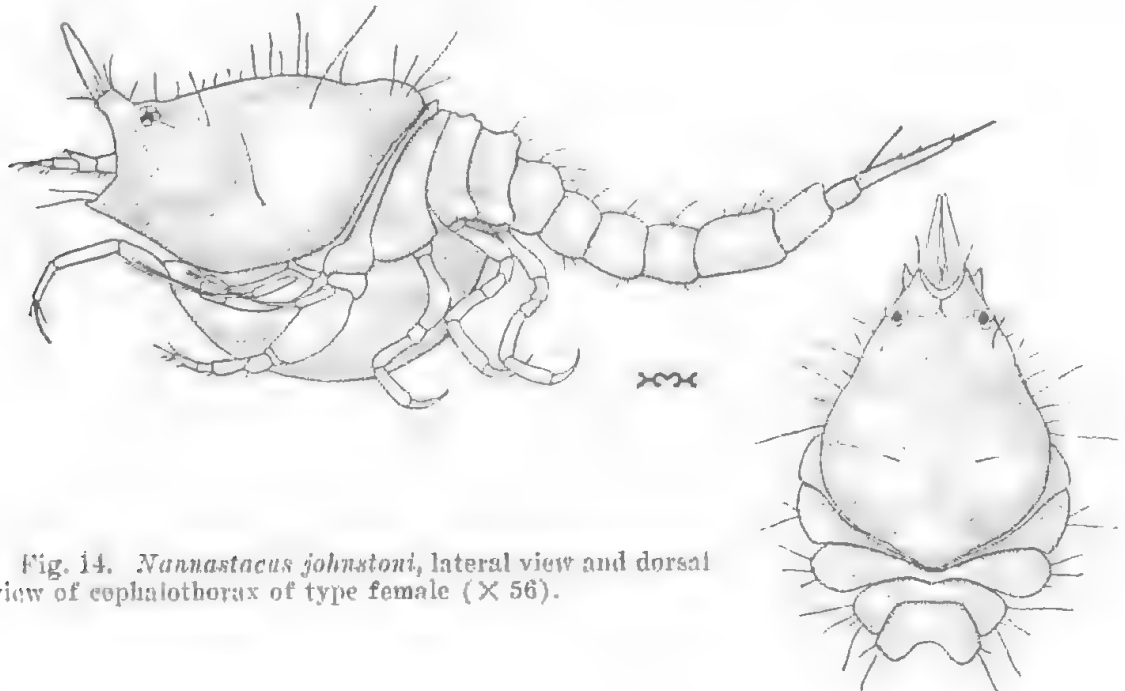


Fig. 14. *Nannastacus johnstoni*, lateral view and dorsal view of cephalothorax of type female ( $\times 56$ ).

Peduncle of uropod, two thirds as long as telsonic somite and half as long as endopod, exclusive of its terminal spine; exopod fully one-seventh as long as endopod and with its terminal spine reaching just beyond three-fourths of length of latter; endopod with three short spines on inner margin, all equal in length, and with terminal spine half the length of ramus.

Length 1.45 mm. Ova in greatest diameter 0.15 mm.

Colour yellow, with dorsum pale brown.

*Adult male.* The usual sexual differences are exhibited. The basis of the first four peraeopods is very wide (about twice as long as wide) and there are the usual lamellate teeth on the anterior pairs (see fig. 15).

Uropod relatively longer than in female; peduncle three-fourths as long as telson, and less than half as long as endopod exclusive of terminal spine; exopod less than one-eighth as long as endopod and with its terminal spine reaching just beyond middle of length of latter; endopod with six spines on inner margin, successively increasing a little in length backwards, and with distal spine fully one-third length of ramus.

Length 1.5 mm.

*Loc.* New South Wales: Sydney; Vaucluse, on stones, between tide marks (type loc., T. H. Johnston, Jan., 1937) and Shark Island, on stones (K. Sheard,

Feb., 1938). Queensland: Moreton Bay, Myora Bight, surface (I. S. R. Munro, various stations, 50 cm. 40 m. net, Nov., 1940). Types in South Australian Museum, Reg. No. C. 2580-2581.

The species is named after Prof. T. Harvey Johnston, who first collected it. The formalin treatment of silt-covered stones produced a good number of ovigerous females which are of two sizes, approximately 1.5 mm. and 1.95 mm., in length.

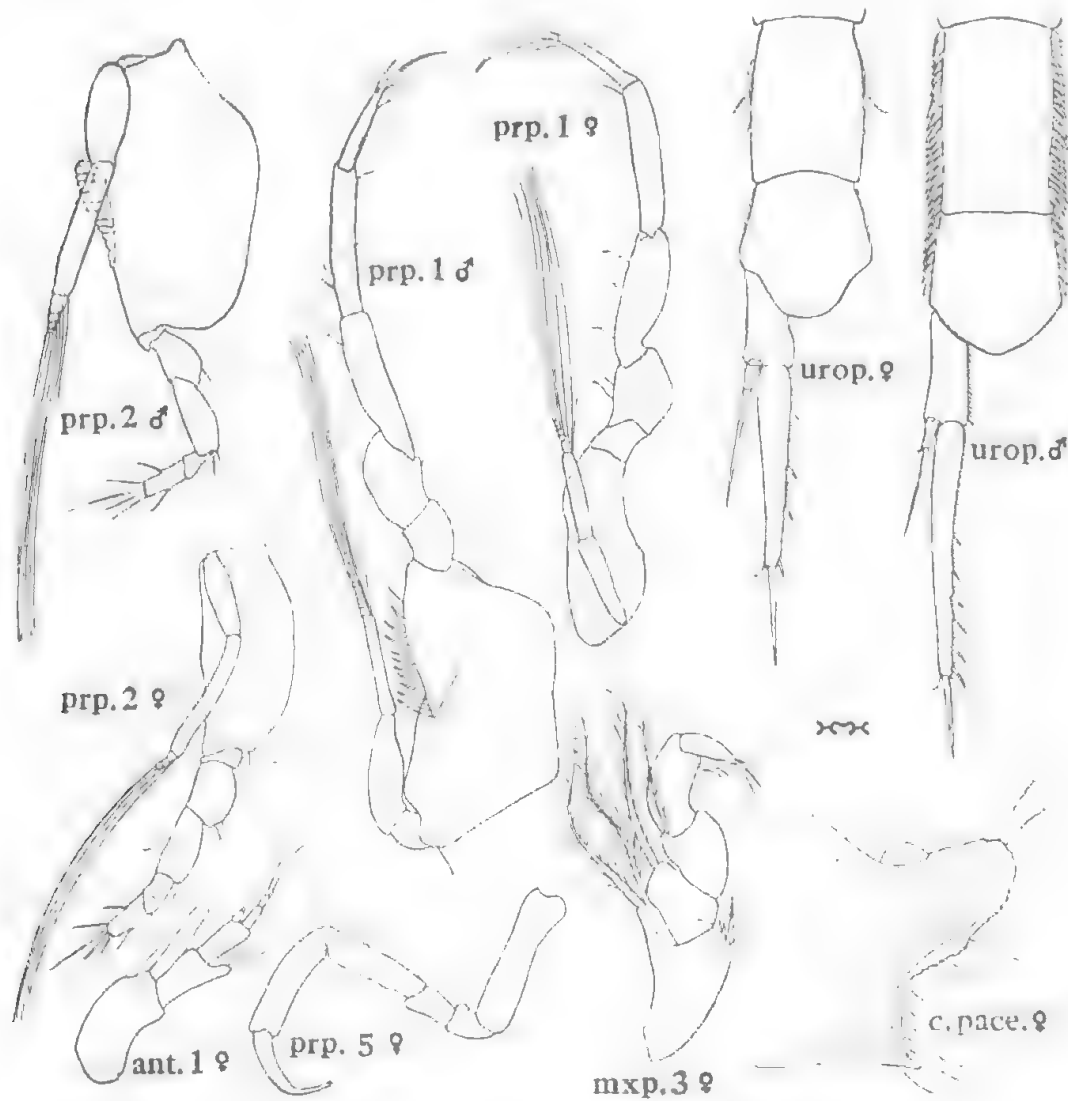


Fig. 15. *Nannastacus johnstoni*, paratypes adult male and ovigerous female; c. pace, anterior portion of carapace, somewhat flattened; ant., mxp. and prp., first antenna, third maxilliped and pereopods; urop., uropods with fifth pleon and telsonic somites (all  $\times 108$ ).

This would seem to be the common *Nannastacus* in Sydney Harbour. It is close to *minor* Calman (1911, p. 357, pl. xxxiv, fig. 1-3); but has the exopod of the uropod relatively shorter in the female, with its distal spine not reaching nearly to distal end of endopod; further, while the branchial regions are more inflated than in Calman's species, there is no median dorsal depression between the tumidities in this sex.

Mr. Munro secured a good number of males only and the species is evidently abundant in Moreton Bay, Queensland, also. These males range in size from 1.5

mm to just over 2 mm, but the appendages show no differences. They were taken in company with males of *inflatus*, which are distinguishable because of the slightly different uropods, in which the peduncle is relatively shorter, the distal spine of the exopod does not quite reach to middle of length of endopod (exclusive of terminal spine) and the distal spine of the endopod is not quite so long, being less than one third the length of the ramus; further, the dactylus of the first pereopod is slightly shorter in relation to the propodus of that limb.

Genus SCHIZOTREMA Calman.

*Schizotrema* Calman, 1911, p. 360; Stebbing, 1913, p. 165 (key).

SCHIZOTREMA ACULEATA Hale.

*Schizotrema bifrons* Hale (*nec* Calman), 1936, p. 429; fig. 18.

*Schizotrema bifrons* var. *aculeata* Hale, *loc. cit.*, p. 430, fig. 19.

Further Australian specimens are available. As the body armature differs always from that described by Calman (1911, p. 362, pl. xxxiv, fig. 18-21) for his *bifrons* from the Gulf of Siam the name *aculeata* may be applied to the Australian form. The delicate spines are easily damaged, but as previously mentioned they do show some variation. Ovigerous females and fully adult males, assumed to belong together, exhibit quite considerable differences in this direction.

*S. bifrons* is described from the female only. Females and almost adult males of *aculeata* have the spinulation much more marked than in the female of *bifrons*, with at least one pair of outstanding dorsal spines, and a similar large lateral spine on each side of the second to fifth pereon somites and on all the pleon somites; the side spines are particularly prominent when the animal is viewed from above (see posterior portion of pleon of female and subadult male in fig. 16). The surface dorsally and laterally bears tiny spinules and some small spines. The fifth pleon somite is as wide as long and is not longer than the telsonic somite; the longest dorsal and lateral spines are equal in length to about half the width of the somite.

*Adult male.* Fully mature males of the same size as ovigerous females (approximately 1.7 mm.) and taken by submarine light at Port Lincoln, South Australia, are here regarded as belonging to *aculeata* because the arrangement of the spines of the dorsum is essentially the same, although the spines themselves are shorter. There are no very large lateral spines as in the adult female and young male.

The carapace is depressed, two-fifths of total length of animal and twice as long as the pedigerous somites together; at the rear is a triangular, low tumidity which is not produced backwards and which is margined on each side by a pair of deep grooves, converging from the posterior end to meet in the mid-line between the branchial regions, and thence diverging to meet a tumidity behind each eye; dorsally and dorso-laterally it is covered with spines, which become tubercular on the lower parts of the sides; one or two spines behind the eyes are larger than the others and there is a conspicuous spine below the pseudorostrum, directed outwards from the front. Antero-lateral corner angular, not produced and with a small spine, behind which is a row of spinules.

First pereon somite exposed as a narrow strip; second to third about as wide as carapace, with pleural parts expanded and armed with spines larger than those of sides; dorsal pair of spines on second and third not larger than pleural spines, on fourth longer, and on fifth as long as longest dorsal spines of first to fourth pleon somites.



Fifth pleon somite fully as wide as long and about as long as telsonic somite, with a row of four or five spines (which successively increase in size) on each side of dorsum; back of telsonic somite with median spine as in female, with dorso-lateral spines short, and with only insignificant lateral spines.

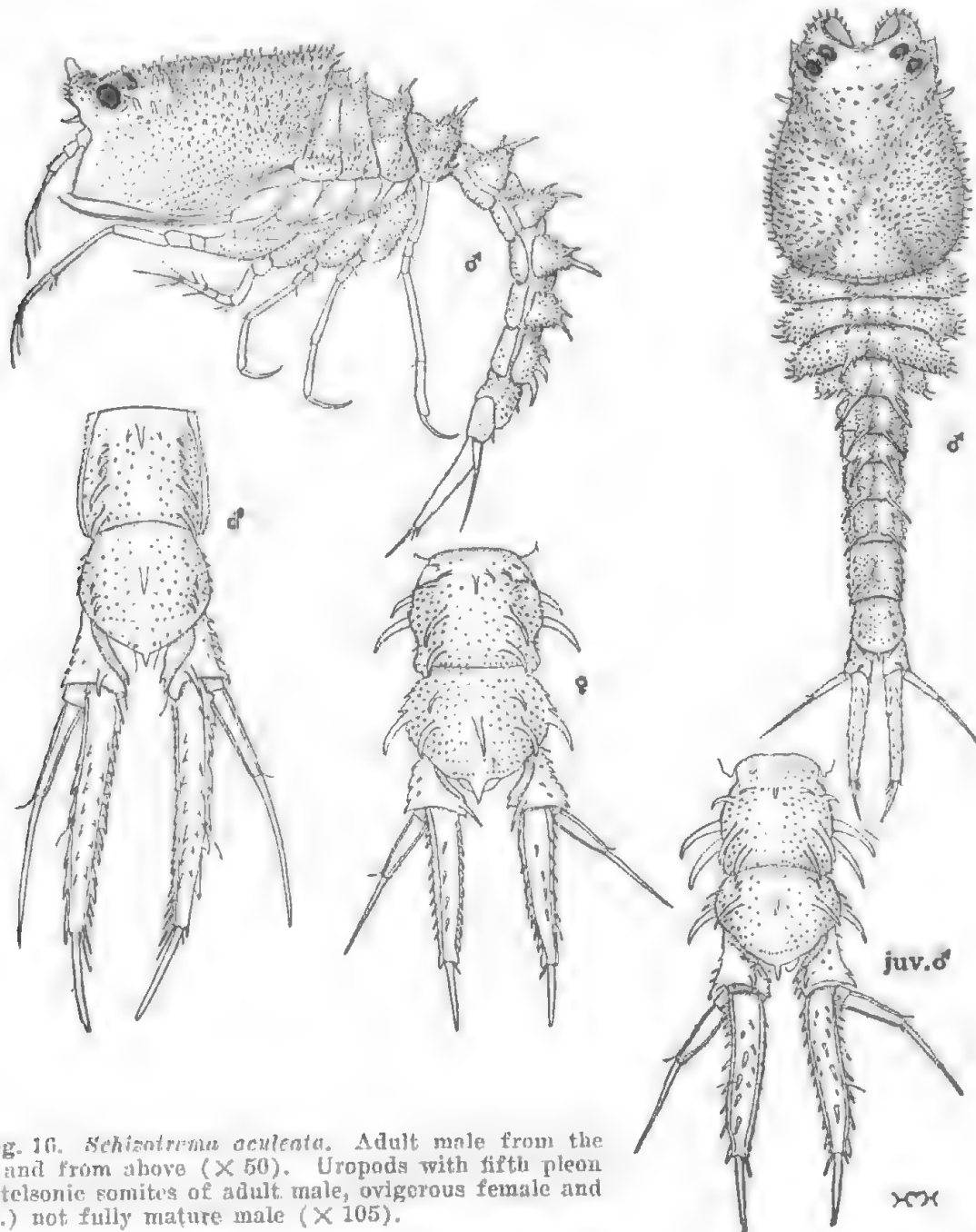


Fig. 16. *Schizotrimma aculeata*. Adult male from the side and from above ( $\times 50$ ). Uropods with fifth pleon and telsonic somites of adult male, ovigerous female and (juv.) not fully mature male ( $\times 105$ ).

On the fourth and fifth peraeon and first to fourth pleon somites there is a longitudinal, median depression between the paired elevations bearing the spines. First antenna with second and third peduncular joints subequal in length, each half as long as the first; accessory flagellum single jointed, about one-fourth as long as first joint of main flagellum.

Third maxilliped with basis longer than rest of limb; merus with an outer subdistal spine, preceding the usual plumose seta, which like one of the two on the outer apical lobe of the basis is unusually stout.

First pereopod with slender terminal joints together more than half as long again as basis; ischium with a strong distal outer spine and merus with smaller spine in same position; carpus and propodus subequal in length, and dactylus less than two-thirds as long as either.

Second pereopod with basis about equal in length to remainder of limb; carpus subequal in length to dactylus and twice as long as merus; dactylus three times as long as propodus, with longest terminal seta equal in length to propodus plus dactylus.

Fifth pereopod with carpus more than half as long again as propodus, which is longer than the dactylus.

Peduncle of uropod more than half as long as telsonic somite and less than one-third as long as endopod exclusive of its terminal spine; exopod nearly half as long again as peduncle, half as long as endopod and with its distal spine reaching to just beyond distal end of last-named; terminal spine of endopod stout, two-fifths as long as its ramus.

*Ovigerous females* have the ramus of the uropod relatively shorter (endopod rarely more than twice as long as peduncle, and exopod as long as peduncle); distal spines of same length in proportion to rami.

Almost mature males (fig. 16, juv.) with lateral body spines as in the female, have the rami of the uropod intermediate in length between those of the ovigerous female and adult male.

Two males from Moreton Bay, Queensland (tow-net at night, Nov-Dec., 1940, I. S. R. Munro) are smaller than the southern specimens (1.5 mm.) and differ in having the spinulation of the carapace far less developed, with the spine below pseudorostral lobes insignificant. In one of them the dorsal processes of the pleon somites are more slender and there are no fairly large spines near the base of the long and prominent apical spine of each elevation, the slope of which bears only small spinules; the second male has the pleon armature as figured.

#### Genus CUMELLA Sars.

*Cumella* Sars, 1864, p. 198; Calman, 1911, p. 344 (key); Stebbing, 1913, p. 178 (syn. and key).

Nine species can be added to the genus since Stebbing's revision, three from the Northern Hemisphere (Hansen, 1920, pp. 29-30, pl. ii, fig. 4-5 and Hart, 1930, p. 15, fig. 5, A-D) three from South-Western Australia (Zimmer, 1914, pp. 179-182, fig. 4-9), and three now proposed.

Zimmer has suggested that *Nannastacus hirsutus* Hansen should be referred to *Cumella* because of the close set eyes of the female. *Cumella lima* Hale (1936, p. 435) has the eyes separated by a very narrow interspace in the female but it is now considered that the species belongs to *Nannastacus*.

It is perhaps scarcely practicable to describe newly discovered species so exhaustively as to preclude any possibility of confusion regarding others subsequently found. For example *Cumella hispida* and *lucris* Calman may be mentioned. There occur in Australian waters several forms distinct from each other and allied to these two species but apparently separable from them. One of these, from southern Australia was formerly recorded provisionally as *lucris* (Hale, 1936, p. 432); another, now available from Queensland, is, in the proportions of the uropods, still closer to *lucris* but the armature of these appendages is different. The relatively slight features distinguishing these two Australian forms from *lucris*, as described from the Gulf of Siam, are constant in long series and both are herein regarded as new; eventually they may be considered varieties or subspecies but in any case separate names seem to be desirable.

The status of the material herein referred to *hispida* remains in some doubt pending further details of the species.

KEY TO AUSTRALIAN SPECIES OF *CUMELLA*.

1. Peduncle of uropod distinctly longer than telsonic somite .. .. . 2.  
Peduncle of uropod at most only as long as telsonic somite .. .. . 5.
2. Carapace with a marked dorsal tumidity at posterior end .. .. . *gibba* Zimmer.  
Carapace with no tumidity at posterior end .. .. . 3.
3. Carapace well arched dorsally. Pseudorostral lobes not projecting in front of ocular lobe.  
Exopod of uropod much shorter than endopod .. .. . *cyclaspoides* Zimmer.  
Carapace with dorsal edge practically horizontal. Pseudorostral lobes projecting in front  
of ocular lobe to form a short but distinct pseudorostrum. Exopod of uropod as long, or  
almost as long, as endopod .. .. . 4.
1. Inner margin of endopod of uropod with spines along practically whole length *munroi* sp. nov.  
Inner margin of endopod of uropod with spines restricted to distal third .. .. . *cana* sp. nov.
5. Terminal spines of rami of uropods not distinctly marked off .. .. . 6.  
Terminal spines of rami of uropods distinctly marked off .. .. . *turgidula* sp. nov.
6. Adult female with two small median dorsal spines on carapace and with pleon not much  
shorter than cephalothorax. Carpus of fifth peraeopod much longer than ischium and merus  
together .. .. . *hispida* Calman.  
Adult female with no dorsal spines on carapace and with pleon only three-fourths as long as  
cephalothorax. Carpus of fifth peraeopod not much longer than ischium and merus together  
.. .. . *michaelseni* Zimmer.

*CUMELLA MUNROI* sp. nov.

*Ovigerous female.* Form as in *laevis* Calman, the back of the carapace almost horizontal and the pseudorostrum very short and truncate in front. Integument with short sparse hairs.

First antenna with last two joints of peduncle subequal in length, and first joint two-thirds as long again as either; accessory flagellum distinct, main lash not longer than last peduncular joint.

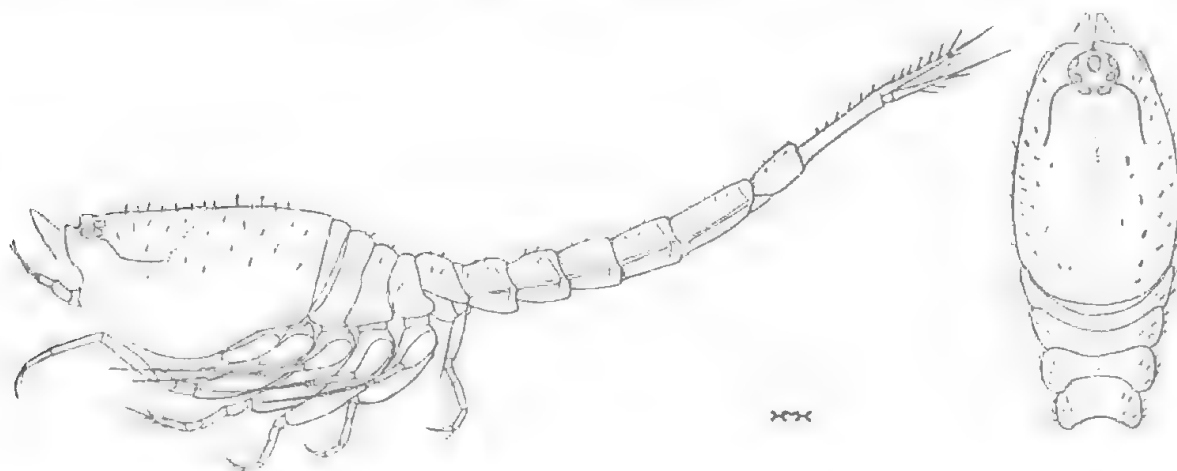


Fig. 17. *Cumella munroi*, lateral view and dorsal view of cephalothorax of type adult male ( $\times 50$ ).

First peraeopod with basis, as in *laevis*, short, less than half as long as rest of limb; carpus shorter than propodus and dactylus together; propodus two-thirds as long again as dactylus.

Second peraeopod with basis about four-fifths as long as rest of limb; dactylus as long as carpus and propodus together and almost as long as merus and carpus together; longest terminal spine of dactylus as long as the joint.

Fifth peraeopod with carpus nearly half as long again as propodus, which is not as long as the slender dactylus.

Uropod with peduncle slender, two-third as long again as telsonic somite and with six short spines (as well as usual minute spinules) on inner margin; endopod, as in female *laccis*, two-thirds as long as peduncle, but with seven spines spaced along length of inner margin and with long terminal spine three-fourths as long as ramus; exopod as long as endopod, with longest of the two unequal terminal spines almost as long as its second joint.

Length 1.6 mm.

*Adult male.* Carapace more than one-third of total length of animal; three-fourths as long again as deep and as wide as deep. Pseudorostral lobes meeting for a distance equal to less than one-third length of ocular lobe, which is large, fully as wide as long, rounded and with seven large corneal lenses. Antero-lateral margin concave and angle obtuse.

Pedigerous somites together four-sevenths as long as carapace; pleural parts of first concealed, those of remainder slightly expanded.

Pleon not much shorter than cephalothorax; fifth somite half as long again as telsonic somite, which is (as in female) little longer than wide and not markedly produced posteriorly.

Peraeopods with joints, apart from the longer basis, of same proportions as in female.

Uropods with peduncle fully twice as long as telsonic somite; endopod two-thirds as long as peduncle and with terminal spine more than three-fourths as long as ramus; exopod with longer terminal spine almost as long as whole ramus; other armature of rami and peduncle as in female.

Length 1.6 mm.

*Loc.* Queensland: Moreton Bay, Green Island, surface (I. S. R. Munro, Station 1, 40 cm. 60 m., net, 7 p.m., Jan. 20, 1940) and Myora Bight, surface (I. S. R. Munro, Stations 27, 28 and 55 [type loc.], 1.30 a.m., 2.30 a.m. and 9.40 p.m., Nov. 29, 1940 and Dec. 6, 1940). Types in South Australian Museum, Reg. No. C. 2631.

While only a single ovigerous female was taken by Mr. Munro's surface nettings, males are abundant in the night hauls mentioned, but only three were secured at Station 1.

Although as aforementioned, the uropods in their slenderness and proportions resemble those of *laccis*, their armature, constant in the series, is quite distinctive.

#### CUMELLA CANA sp. nov.

*Cumella lacve* Hale (*nee* Calman), 1936, p. 432, fig. 20-21.

The differences between the southern Australian material and the female described by Calman are discussed *at supra*. The uropods in *cana* have the peduncle wider, less than six times as long as broad (about ten times in *laccis*), serrate on inner edge and with the terminal spine of the endopod barely half the length of the ramus instead of fully two-thirds as long as it; normally there are four inner spines on this ramus in the male but rarely there are five; the endopod in the female has three or four inner spines. The name is given in allusion to the grey colouration.

In fig. 18 the appendages of *cana* are compared with those of *munroi*. The former differs in that (1) the first peraeopod has the carpus longer than propodus and dactylus together, and the lamellate spines at the edge of the exopodal recess of the basis are stronger; (2) the second peraeopods have the dactylus much shorter than merus and carpus together; (3) the dactylus of the fifth peraeopod is shorter; (4) the uropods are stouter, with different armature and with peduncle shorter in relation to telsonic somite and endopod.

*Loc.* South Australia: St. Vincent Gulf, Sellick's Reef (type loc., H. M. Hale, Mar.-Apl., 1936) and Brighton on shingle bar (K. Sheard and B. C. Cotton, Mar., 1937), and Port Willunga on reef (H. M. Hale, Apl., 1944); Spencer Gulf, Memory Cove, 3 fath. (K. Sheard, submarine light, 8 to 8.30 p.m., Feb., 1941); Kangaroo Island, Antechamber Bay, 4 fath. (K. Sheard, submarine light, 8 to 8.30 p.m., Apl., 1941). Types in South Australian Museum, Reg. No. C. 2032.

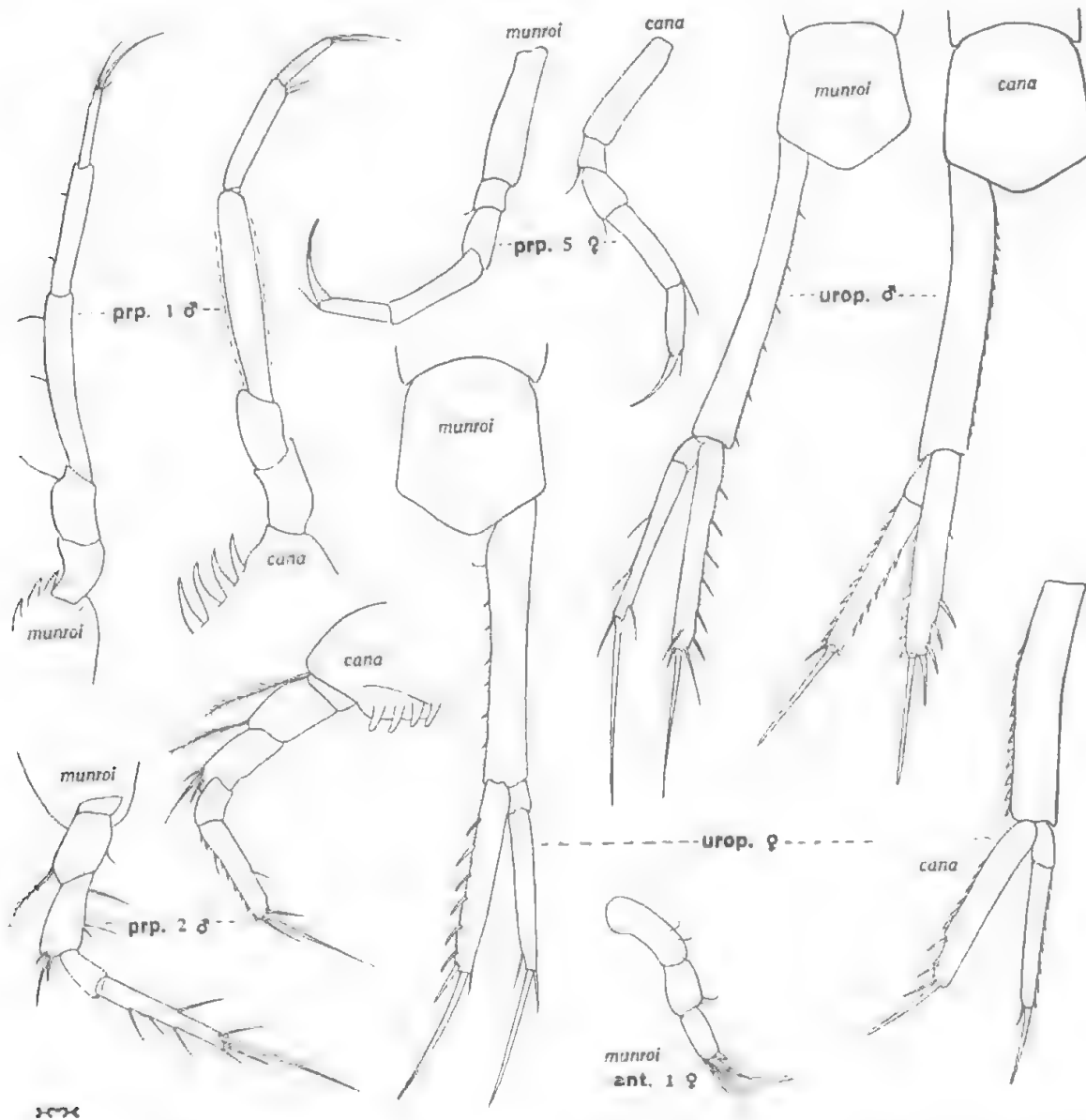


Fig. 18. *Cumella munroi* and *C. cana*; ant., prp. and urop., first antenna, peraeopods and uropods ( $\times 145$ ).

Adult males range in length from 1.6 mm. to 1.84 mm. One of the larger examples has the uropods as figured (although with five inner spines on endopod) but the proportions of the first and second peraeopods differ slightly in that the dactylus of the first pair is only half as long as propodus, while that of the second is not much longer than the carpus. The main and most prominent difference in this exceptional example lies, however, in the fifth leg, which is relatively half as long again as in other individuals and has the carpus four-fifths as long again as

propodus. Also, this peracopod is here as long as the second leg, whereas in typical males (seemingly fully adult, and with long setae on the thoracic exopods) it is much shorter than that limb and has the carpus only about half as long again as propodus. As noted elsewhere, the attainment of complete sexual maturity by the male of some other Cumacea results in considerable changes and one may venture to suspect in this case the possibility of two forms of this sex, both apparently adult: this assumption, however, should be viewed with caution and there is the possibility that the long-legged male represents another species.

*CUMELLA TURGIDULA* SP. NOV.

*Adult male.* Integument of back and sides granulate, the granules rather more conspicuous on pedigerous somites than on carapace, and clothed with short yellow hairs which become sparser on the pleon.

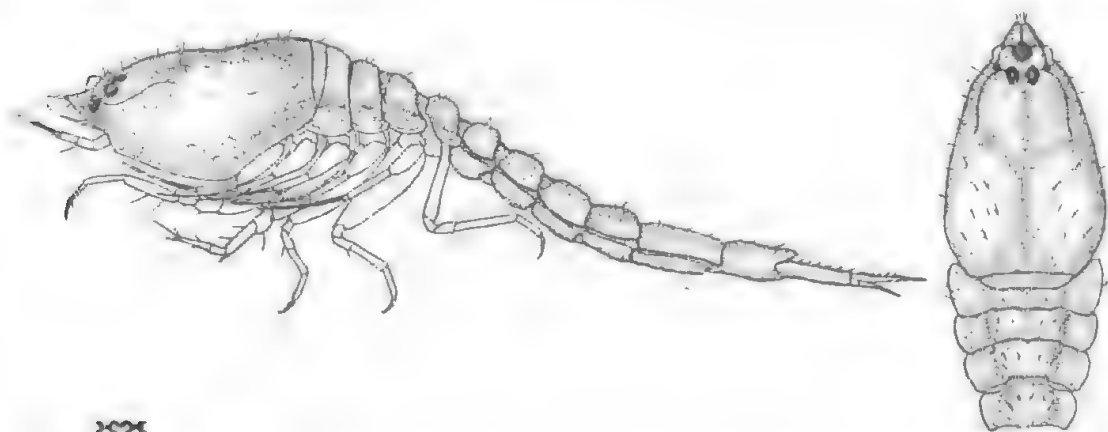


Fig. 19. *Cumella turgidula*, lateral view and dorsal view of cephalothorax of type male ( $\times 23$ ).

Carapace not quite one-third of total length of animal; a little depressed and nearly twice as long as deep; seen from above it tapers towards the front and is widest across the branchial regions which are somewhat inflated; there is a low, median carina, interrupted between the branchial tumidities by a short broad furrow; at the posterior end of each pseudorostral suture there is a small boss; seen from the side the pseudorostrum is not upturned, its concave upper margin curving back and up to above the eye; thence the dorsal contour is arched, with a depression behind middle of length, posterior to which is a low hinder tumidity. Antero-lateral margin shallowly concave and antero-lateral corner rounded, obtusely-angular. Pseudorostral lobes meeting in front for a distance equal to fully half length of ocular lobe; anteriorly they are subacute, crenulate, with a few setae and seen from the side very oblique. Ocular lobe wider than long, with seven large corneal lenses, one pair colourless, the others black.

First pedigerous somite exposed above, concealed on lower part of side by the anterior pleural lobe of second; third to fifth with pleural parts expanded and slightly backwardly produced; second almost as wide as carapace and, like the third, with a faint median carina.

First four pleon somites subequal in length, each distinctly shorter than the fifth, which is narrow, twice as long as wide; telsonic somite almost as long as fifth, less than twice as long as wide, scarcely dilated posteriorly, produced above bases of uropods where it is rounded with a small median terminal point; back of all somites rounded without trace of median ridge.

First joint of peduncle of first antenna twice as long as third, which is barely shorter than second; second joint of flagellum not much shorter than first; accessory lash single-jointed, minute.

Second antenna with flagellum reaching just beyond end of pleon.

Third maxilliped with ischium short and propodus half as long again as carpus.

First pereopod with carpus not quite reaching level of antennal angle; basis as long as ischium to propodus together; ischium and merus subequal in length; carpus about two and one-third times as long as merus and one-third as long again as propodus, which is twice as long as the short dactylus.

Second pereopod with basis as long as rest of limb; ischium very short; carpus fully half as long again as merus and longer than dactylus, which is quite twice as long as propodus and has its longest terminal spine equal in length to itself.

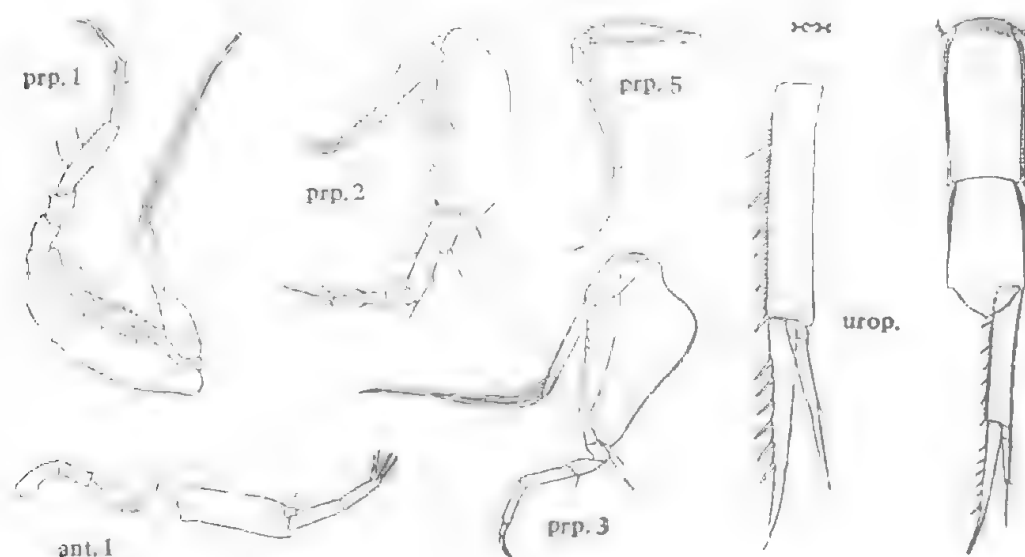


Fig. 20. *Cunnella turgidula*, type male; ant. 1, first antenna ( $\times 45$ ; last peduncular joint and flagella,  $\times 160$ ); prp., pereopods ( $\times 45$ ); urop., uropod ( $\times 86$ ); with fifth pleon and telsonic somites ( $\times 45$ ).

Fifth pereopods with carpus more elongate than in preceding legs, nearly three times as long as merus and three-fourths as long again as propodus.

Peduncle of uropod equal in length to telsonic somite and barely longer than endopod, inclusive of its terminal spine; its inner margin is spinulose and is armed with six large spaced spines, successively decreasing in length towards the rear; exopod three-fourths as long as endopod, and as long as its stout terminal spine; endopod with six spines, equal in size, on inner margin and with a robust distal spine more than half as long as the ramus.

Colour: evenly shaded with brown excepting for the anterior part of carapace (where the colour merges into dark amber) and a pale yellow edging at margins of carapace and anterior and posterior edges of somites. First antennae brown, with edges of joints pale; other appendages translucent, save that the distal joints of the first legs are tinged with brown.

Length 2.9 mm.

Loc. South Australia: Spencer Gulf, Memory Cove, 3 fath. (type loc., K. Sheard, submarine light, Feb., 1944); St. Vincent Gulf, Port Willunga, 1 fath., on reef (H. M. Hale, Apl., 1944). Type in South Australian Museum, Reg. No. C. 2572.

The type was taken in company with numerous males of *Nannastacus asper*, *inflatus* and *subinflatus*. It is close to *C. hispida* Calman (see below) but is a little larger than the female type of that species, and than the male which is here tentatively assigned to Calman's species. It differs in the proportions of the uropods and in having the terminal spines of the last-named separated off from the rami.

#### CUMELLA HISPIDA Calman.

*Cumella hispida* Calman, 1911, p. 347, pl. xxxii, fig. 11-14; Zimmer, 1914, p. 179.

*Ovigerous female.* Three examples 1.88 mm. to 2 mm. in length agree in general closely with Calman's description. The carapace has a shallow depression just anterior to the hinder margin and two small median teeth in the front half; there is a fine but distinct median carina for the whole length of carapace. Ocular lobe

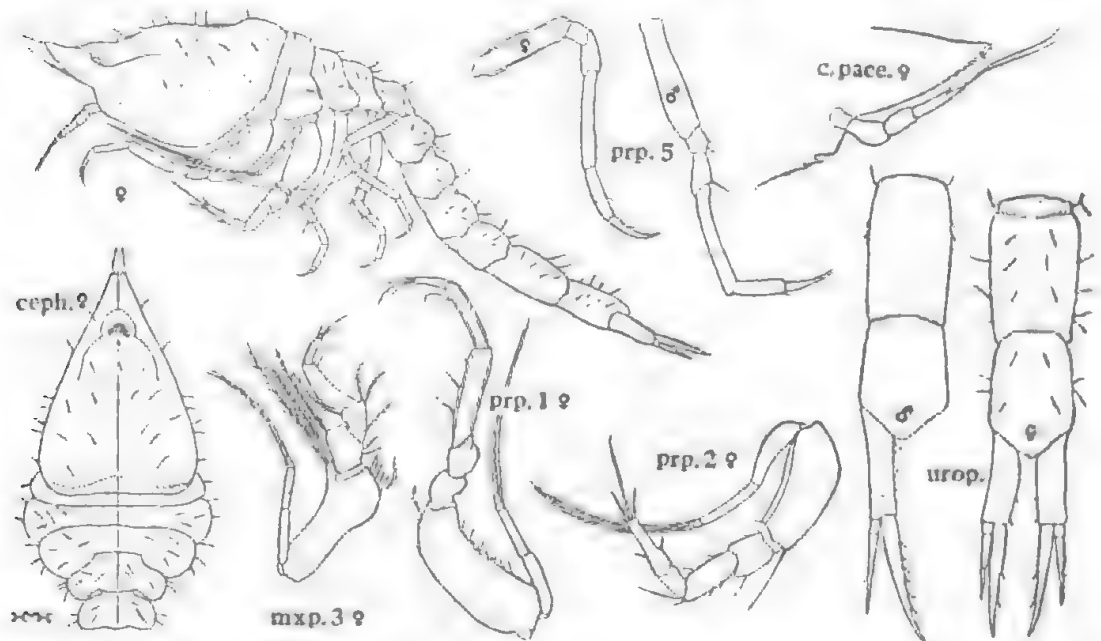


Fig. 21. *Cumella hispida*, ovigerous female and adult male; lateral view and (ceph.) cephalothorax from above ( $\times 36$ ); c. pace, anterior portion of carapace and first antenna ( $\times 68$ ); mxp. and prp., third maxilliped and pereopods ( $\times 68$ ); urop., uropods with fifth pleon and telsonic somites ( $\times 68$ ).

wider than long, rounded, slightly constricted at base, and minutely incised at apex. Pseudorostral lobes pointed in front very oblique as seen from side and serrate near anterior ends; meeting in front of ocular lobe for a distance equal to one-sixth of length of carapace. Antero-lateral angle rounded, obtuse, and margin posterior to it serrate for a short distance.

Pedigerous somites expanded and swollen laterally; first fully as wide as carapace, second wider, and third but slightly narrower; each with a fine median carina.

Pleon four-fifths as long as carapace and pedigerous somites together; somites one to four with thin median ridge; fifth somite fully half as long again as wide, tapering towards the rear; telsonic somite not quite as long as fifth pleon somite, very slightly dilated posteriorly, somewhat angularly produced above bases of uropods and a little more than half as long again as wide.

First joint of peduncle of first antenna longer than third, which is longer than second; third joint at least three times as long as wide.



Basis of third maxilliped as long as rest of limb; ischium very short, propodus twice as long as dactylus, and half as long again as carpus which is subequal to merus; with exopod.

First pereopod with basis only as long as ischium, merus and carpus together; the carpus is long, more than one-third longer than propodus, longer than ischium and merus together and three times as long as dactylus.

Basis of second pereopod two-thirds as long as rest of limb and twice as long as dactylus; ischium distinct; carpus longer than ischium and merus together and as long as dactylus which is nearly twice as long as propodus, with its main terminal spine almost as long as its own length together with that of propodus.

Fifth pereopod with carpus half as long again as propodus and little more than twice as long as merus, and a little shorter than basis.

Peduncle of uropod about three-fourths as long as telsonic somite and shorter than endopod, including stout terminal spine of latter, which is not distinctly marked off; exopod including distal spine more than two-thirds length of endopod; endopod and peduncle each with two small inner spines.

Colour lemon yellow, with faint shadings of brown on carapace.

*Loc.* South Australia: Port Willunga, on reef (H. M. Hale, April, 1944—example figured). Queensland: Moreton Bay, Myora Bight, surface (I. S. R. Munro, Nov., 1940).

The only differences leaving doubt as to the identity of these examples are (1) the smaller size; (2) the relatively shorter carpus of the fifth pereopod; (3) the slightly different proportions of the uropod.

*Adult male.* General form as in *turgidula* sp. nov. Fifth pleon somite nearly twice as long as wide and a little longer than telsonic somite which is about half as long again as wide and is well produced posteriorly.

First pereopod with basis longer than ischium to propodus together; carpus nearly half as long again as propodus, which is more than twice as long as dactylus.

Basis of second pereopod as long as remaining joints together the latter as in female described above.

Fifth pereopod with carpus twice as long as propodus, two and one-half times as long as merus and little shorter than basis.

Peduncle of uropod a little shorter than telsonic somite and five-sixths as long as endopod including terminal spine which, as in the females recorded above, is not distinctly marked off; its inner edge bears a few short spines; exopod distinctly more than three-fourths as long as endopod which has six spines on inner margin, the last inserted just before the third fourth of length of ramus.

Length 2.15 mm.

*Loc.* Queensland: Moreton Bay, Myora Bight, surface (I. S. R. Munro, various stations, Nov., 1940).

#### Genus *Pterocuma* Hale.

*Pterocuma* Hale, 1936, p. 415 and 1943, p. 338.

This genus was established on the female and was tentatively referred to the Bodotriidae. The male, now described, has exopods on the first three pairs of pereopods (as in the female) pleopods are absent and the second antenna has a short and stout, prehensile flagellum. The mandible, as in *Compylaspis*, is moderately wide towards the base but the incisor process is narrow as in *Cumella* (interior part of base not shown in Hale, 1936, fig. 8b).

*Pterocuma* thus differs from all other Nannastacids in having an exopod on the third pereopods of the female and none on the fourth pair of the male. The genus in other respects is not typical of the family. The antero-lateral corner of the carapace is not at all angular or prominent, the third maxillipeds are re-

markably pediform, the fossorial legs are stout and short, with basis not enlarged in exopod-bearing pairs of the male, and the uropods are relatively massive. The latter resemble those of *Campylaspis platyuropus* Calman (1911, p. 364, pl. xxiv, fig. 25-29) which by this character stands apart in its genus. The second male antennae resemble those of *Lamprops fuscata* Sars (1899, p. 20, pl. xi). For the present, however, it seems best to consider *Picrocuma* as an aberrant genus of the Nannastacidae.

PICROCUMA POECILOTA Hale.

*Picrocuma poecilota* Hale, 1936, p. 415, fig. 7-8 and 1943, p. 338, fig. 3-6.

*Adult male.* (Table Bay, Tasmania). Integument slightly roughened, somewhat polished.

Carapace small in relation to whole animal, barely longer than pedigerous somites together, two-sevenths of total length, distinctly compressed and with depth equal to nearly three-fourths its length; seen from the side the dorsal con-

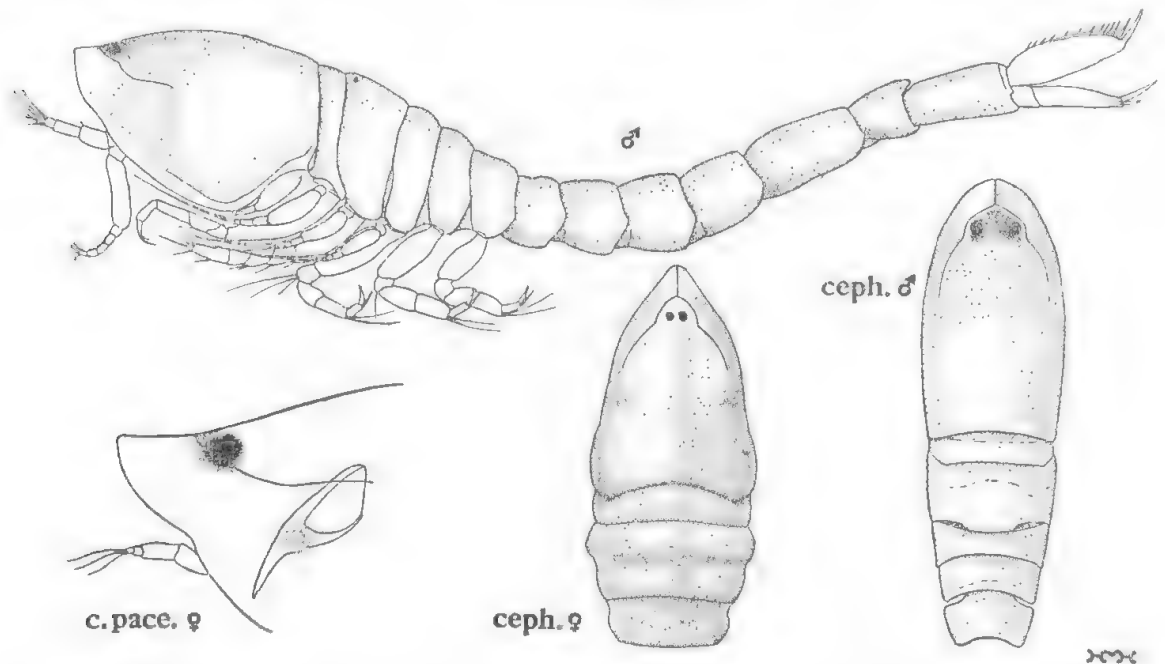


Fig. 22. *Picrocuma poecilota*. Adult male, lateral view and (ceph.) cephalothorax from above ( $\times 72$ ). Adult female; c. pace, anterior portion of carapace showing outline of mandible ( $\times 72$ ); ceph., dorsal view of carapace and first three pedigerous somites ( $\times 40$ ).

tour is slightly and smoothly arched, with a not very pronounced angle at base of pseudorostrum, which is not at all upwardly directed. Antero-lateral margin very shallowly concave and oblique; no indication of antero-lateral angle. Pseudorostral lobes roundly subtruncate in front, oblique as seen from the side, meeting in front of ocular lobe for a distance equal to one-tenth of length of carapace. Ocular lobe twice as wide as long, sooty and with a pair of darker areas apparently representing the eyes (fig. 22, ceph.).

All five pedigerous somites fully exposed; second much the longest, twice as long as third or fourth; fifth longer than fourth and first shortest of all; pleural portions scarcely or not at all expanded.

Pleon nearly twice as long as pedigerous somites together; somites one to four successively increasing in length; fifth abruptly longer, half as long again as fourth, and half as long again as wide; telsonic somite as wide as long, posteriorly rounded, little produced, and somewhat dilated, but not strikingly so.

First antenna almost as long overall as second; with third joint of peduncle barely shorter than second, and with first about as long as second and third together; first joint of main flagellum stout, with a dense brush of sensory filaments, which conceal at least a second joint.

Second antenna with flagellum stout, curved, subequal in length to last peduncular joint; five-jointed and apparently with a small terminal jointlet concealed by a dense series of setae emanating from the fifth joint.

The maxillae and first and second maxillipeds are as in *Cumella*. The last joint of the first maxilliped is elongate, more than two-thirds as long as the penultimate joint.

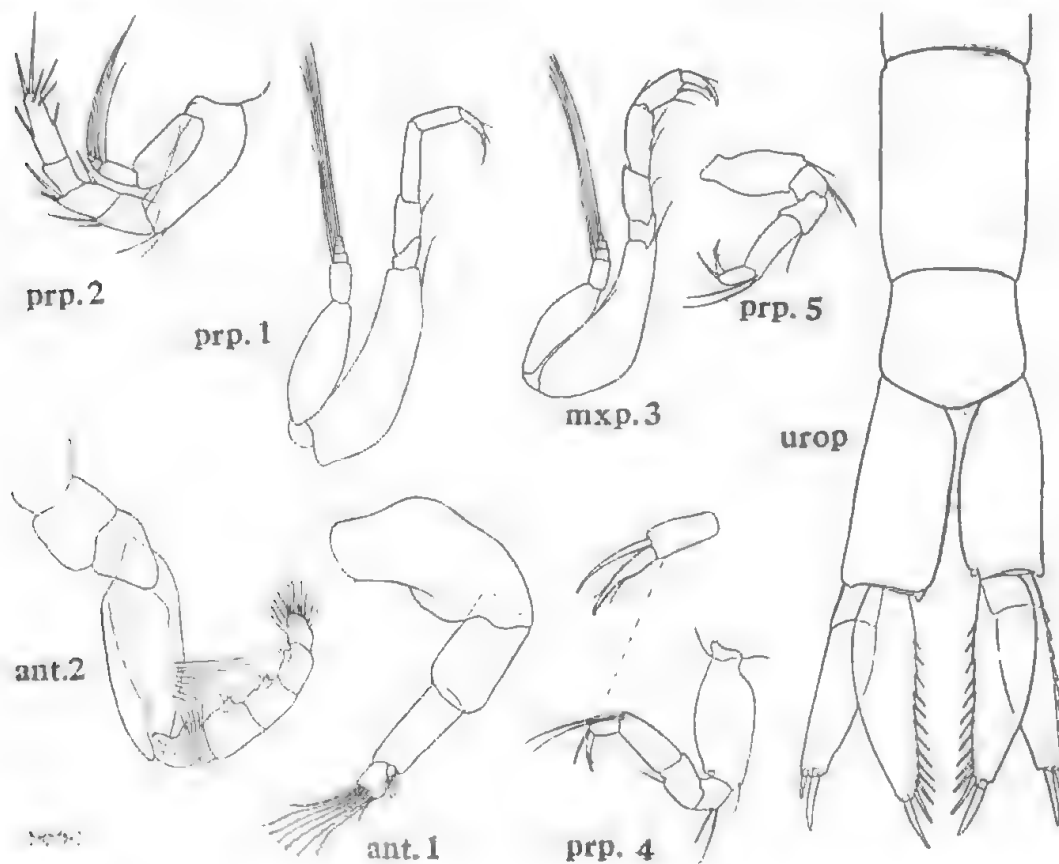


Fig. 23. *Pterocuma poecilota*, adult male; ant., first and second antennae ( $\times 220$ ); prp., pereopods ( $\times 112$ ; dactylus of fourth  $\times 220$ ); urop., uropod with fifth pleon and telsonic somites ( $\times 112$ ).

Third maxilliped (as in female) scarcely differing from first pereopod; its basis is a little shorter, but the rest of limb is equal in length to that of first leg, although stouter; carpus longer than merus or propodus, which are subequal in length; exopod stout.

First pereopod short, its total length barely equal to that of carapace; basis almost as long as remaining joints together; carpus as long as ischium and merus together, the latter longer than propodus.

Second pereopod with basis shorter than rest of limb, merus a little longer than carpus, and dactylus more than twice as long as propodus; (while the ischium is distinct in the female, I cannot distinguish it in the fully adult male).

Exopod of third pereopod well-developed, with robust flagellum; basis in third and fourth pereopods almost half as wide as long, and about equal in length

to ischium, merus and carpus together; in the fifth pair it is shorter. Carpus of fossorial peraeopods as long as ischium and merus together and more than twice as long as propodus with two slender, stiff distal setae, reaching beyond tip of dactylus; propodal seta stout, almost spine-like, reaching to tip of dactylus.

Peduncle of uropod half as long again, and almost as deep, as telsonic somite; very broad, its width nearly half its length, and without armature; rami wide, the endopod a little longer than exopod and as long as peduncle; exopod with two unequal distal spines, the longer nearly one-third as long as the ramus; endopod with a stout distal spine a little more than one-fourth its own length and with a series of a dozen spines on inner face, successively increasing in length backwards (in the female there is normally a row of several spines at distal part of inner edge).

The size of the uropod relative to the peraeopods is shown in fig. 23, where both are drawn to the same scale.

Colour: a broad band of purplish brown across anterior portion of carapace.

Length 1.4 mm.

The adult male is thus smaller than the ovigerous female already described, and also from Tasmania.

*Subadult male* (Sellick's Beach, South Australia). As the short second antennae are completely concealed beneath the opaque carapace the only external features which distinguish the young male from the juvenile female are the slightly more slender form and the denser sensory filaments of the first antenna. The latter has fewer filaments than in the adult and the peduncular joints are more globose, while the flagellum consists of three joints — if the small terminal element is in reality a true joint; the third peduncular joint bears sensory filaments not discernible in the adult described above.

*Adult female, Queensland.* Some females with small marsupium, together with an adult male, were taken in Myora Bight, Moreton Bay, by surface netting (I. S. R. Munro, June and Nov., 1940). The females have the carapace less swollen than in the type, but it is tumid on each side towards the front and also over the branchial regions, so that, viewed from above, the lateral margins are sinuate (fig. 22, ceph. ♀). The second pedigerous somite is transversely tumid fore and aft, there being a shallow gutter between the swellings; the third somite is similarly transversely elevated in the posterior half. The uropod is not as robust as in the male and its endopod has usually seven spines on the distal half of the inner margin. The thoracic appendages are as in the southern examples.

Length: females up to 1.9 mm.; male 1–2 mm.

#### GENUS *CAMPYLASPIS* Sars.

*Campylaspis* Sars, 1865, p. 200; Stebbing, 1913, p. 187 (syn. and key); Hansen, 1920, p. 36 (discussion of genus).

Stebbing keys twenty-three species. Since then Stephensen (1915, p. 32, fig. 19), Hansen (1920, pp. 38–47, pl. iii–iv), Hart (1930, p. 38, fig. 5, E–I) and Zimmer (1936, p. 427, fig. 35) have described eight new species from the Northern Hemisphere; Foxon (1932, p. 393, fig. 9–10) the single species hitherto recorded from Australia, and the present writer (Hale, 1937a, p. 41, fig. 2–3) one from the Antarctic. Thirteen new species are recorded herein, bringing the total for the genus to forty-six.

Both sexes are known in relatively few of the species but because of the considerable differences in the sculpture of the carapace, a general key, based on that of Stebbing, may be attempted. As the appendages are insufficiently described in some of the species this leaves much to be desired. Hansen stresses the importance of the maxillipeds and first two pairs of peraeopods for systematic pur-

poses. Details of these appendages will become increasingly necessary as further new species are discovered having body sculpture similar to that of one or other of the forms already recorded.

Apart from the proportions of the joints of the second pereopod, the relative lengths, character, and position—terminal or subterminal—of the distal setae or spines of the dactylus are worthy of notice.

Reference to the figures of the various authors will show that the differences in the third maxilliped are more apparent than would seem to be indicated in the key to the species. The third to fifth pereopods are of negligible taxonomic interest in this genus, as generally they differ little, while Hansen (1920, p. 44) considers that too much reliance cannot be placed upon the proportions of the uropods and their non-articulated armature.

### KEY TO SPECIES OF *CAMPYLASPIS*.

1. Carapace smooth without tubercles, spines, carinae or lateral furrow .. 2.  
Carapace with tubercles, spines or carinae, or at least with a shallow furrow on each side .. 3.
2. Ocular lobe obsolete .. .. 3.  
Ocular lobe normal .. .. 4.
3. Inner margin of merus of third maxilliped serrate .. .. *nitens* Bonnier.  
Inner margin of merus of third maxilliped not serrate .. .. *alba* Hansen.
4. Exopod of uropod a little longer than endopod .. .. *pulchella* Sars.  
Exopod of uropod not longer than endopod .. .. 5.
5. Peduncle of uropod three-fourths as long again as endopod .. .. 6.  
Peduncle of uropod at least twice as long as endopod .. .. 7.
6. Second pereopod with dactylus shorter than carpus and propodus together .. *glabra* Sars.  
Second pereopod with dactylus longer than carpus and propodus together .. *pacnoglabra* Stebbing.
7. Eye lenses absent .. .. 8.  
Eye lenses present .. .. 9.
8. Carapace with dorsal margin smoothly arched. Uropod of female as long as last three pleon somites together and with peduncle barely more than twice as long as endopod .. *orientalis* Calman.  
Carapace with dorsal margin slightly uneven. Uropod of female longer, as long as last four pleon somites together and with peduncle distinctly more than twice as long as endopod .. *pacifica* Sars.
9. Second pereopod with dactylus longer than carpus and propodus together .. *rubicunda* Lilljeborg.  
Second pereopod with dactylus not as long as carpus and propodus together .. 10.
10. Distal segment of second maxilliped with two spines .. .. *rufa* Hart.  
Distal segment of second maxilliped with four spines .. .. 11.
11. First pereopod with carpus barely longer than propodus. Uropod of male with peduncle three times as long as endopod .. .. *thompsoni* sp. nov.  
First pereopod with carpus much longer than propodus. Uropod of male with peduncle two and one-fourth times as long as endopod .. .. *stimilia* sp. nov.
12. Carapace with ridges, if present, simple folds, not tuberculate or formed from rows of tubercles or spines .. .. 13.  
Carapace with ridges, if present, tuberculate or formed from rows of tubercles or spines .. 28.
13. Each side of carapace with a faint furrow which is not margined either above or below by a ridge or fold .. .. 14.  
Each side of carapace with at least one ridge or fold on each side .. .. 15.
14. Dactylus of second pereopod about as long as carpus, blunt-ended and not tapering .. *canaliculata* Zimmer.  
Dactylus of second pereopod longer than carpus, and tapering to the narrow distal end .. *unilineata* sp. nov.
15. Carapace with one oblique ridge on each side .. .. 16.  
Carapace with more than one ridge on each side .. .. 17.
16. Peduncle of uropod remarkably broad and only one-third as long again as endopod .. *platyuropus* Calman.  
Peduncle of uropod slender, three times as long as endopod .. .. *multiplicata* sp. nov.

17. Carapace of an eroded appearance, with four irregular, subrectangular, depressed areas on each side, bordered by prominent folds .. *rufa* sp. nov.  
Carapace not so sculptured, with carinae on each side subparallel .. 18.
18. Two oblique carinae arising anteriorly and extending for greater part of length of carapace on each side .. 19.  
Three oblique carinae arising anteriorly and extending for greater part of length of carapace on each side .. 27.
19. Pseudorostrum unusually long, the lobes meeting for a distance equal to at least one-sixth of length of carapace .. 20.  
Pseudorostrum much shorter .. 21.
20. Ocular lobe obsolete. Peduncle of uropod one third as long again as rami .. *pitius* Foxan.  
Ocular lobe small, elongate. Peduncle of uropod more than twice as long as rami .. *vitrea* Calman.
21. Ocular lobe linguiform, narrow and dilated distally .. *macrophthalma* Sars.  
Ocular lobe not linguiform, rather broad and not at all dilated distally, or obsolete .. 22.
22. Second pereopod with dactylus longer than carpus and propodus together .. 23.  
Second pereopod with dactylus shorter than carpus and propodus together .. 24.
23. Carapace with a transverse dorsal carina behind ocular lobe, uniting the uppermost lateral carinae, and with a short lateral carina, meeting its fellow dorsally near posterior end. Merus of third maxilliped narrow, twice as long as wide .. *johnstoni* Hale.  
Carapace without these carinae. Merus of third maxilliped less than twice as long as wide .. *sulcata* Sars.
24. Ocular lobe obsolete, without corneal lenses .. *ovalis* Stebbing.  
Ocular lobe large, with corneal lenses .. 25.
25. Dactylus of second pereopod dilated and rounded at distal end, articulated to which is a short process .. *latidactyla* sp. nov.  
Dactylus of second pereopod tapering to the narrow distal end, which bears long setae .. 26.
26. Merus of third maxilliped narrow, about twice as long as wide. Carpus of first pereopod shorter than propodus .. *undata* Sars.  
Merus of third maxilliped wide, not much longer than broad. Carpus of first pereopod longer than propodus .. *minor* sp. nov.
27. Lowest of the three lateral keels bifurcate posteriorly. Merus of third maxilliped much shorter than carpus and propodus together .. *costata* Sars.  
Lowest of the three lateral keels not bifurcate. Merus of third maxilliped much longer than carpus and propodus together .. *triplicata* sp. nov.
28. Carapace with no tuberculate carinae, nor with spines combined in rows on sides to form ridges .. 29.  
Carapace with tuberculate ridges, or with some of the tubercles combined in rows on sides .. 41.
29. Carapace not spinose, the sides with a very few low tubercles or with inconspicuous granule-like tubercles .. 30.  
Carapace spinose, or with many conspicuous tubercles on sides .. 33.
30. Carapace with tiny granule-like tubercles .. 31.  
Carapace with a few low dorsal protuberances .. 32.
31. Ocular lobe narrow, about twice as long as wide. Distal joint of second maxilliped with three spines. Carpus of third maxilliped large, two-thirds as long as merus .. *laticarpa* Hansen.  
Ocular lobe wider than long. Distal joint of second maxilliped with four spines. Carpus of third maxilliped small, scarcely more than one-third as long as merus .. *roscida* sp. nov.
32. Distal joint of second maxilliped with three spines. Peduncle of uropod smooth .. *affinis* Sars.  
Distal joint of second maxilliped with four spines. Peduncle of uropod serrate .. *serratipes* Hansen.
33. Tubercles of carapace distinctly spine-like, either robust with acute apices, or slender .. 34.  
Tubercles of carapace never slender, but rounded or subconical with blunt apices .. 35.
34. Dorsum of carapace with stout spines. Ocular lobe narrow, not dilated distally. Distal joint of second maxilliped with three spines. Propodus of third maxilliped subequal in length to carpus. Peduncle of uropod not spinose .. *spinosa* Calman.  
Dorsum of carapace with slender spines. Ocular lobe linguiform, dilated distally. Distal joint of second maxilliped with two spines. Peduncle of uropod spinose .. *echinata* sp. nov.
35. Merus of third maxilliped triangular, expanded distally and as wide as long .. *frighta* Hansen.  
Merus of third maxilliped oblong, never as wide as long .. 36.
36. Merus of third maxilliped unusually slender, about three times as long as wide .. *pustulosa* sp. nov.  
Merus of third maxilliped not more than twice as long as wide .. 37.

37. Merus of third maxilliped as long as carpus and propodus together .. .. 38.  
 Merus of third maxilliped much shorter than carpus and propodus together .. .. 39.
38. Fifth pleon somite with feeble transverse sulcus. First two pedigerous somites elevated dorsally to form pro-curved lamellae .. .. *verrucosa* Sars.  
 Fifth pleon somite with strongly developed transverse sulcus. First two pedigerous somites not elevated dorsally .. .. *aspera* sp. nov.
39. Pleon somites without dorsal teeth, at most with feeble tubercles on first three somites .. 40.  
 Pleon somites with dorsal teeth .. .. *antarctica* Calman.
40. No depressed area on sides of carapace. Merus of third maxilliped not expanded on inner side. Dactylus of second pereopod barely as long as carpus .. .. *nodulosa* Sars.  
 A depressed area on each side of carapace. Merus of third maxilliped triangularly expanded on inner side. Dactylus of second pereopod longer than carpus .. .. *globosa* Hansen.
41. Dactylus of second pereopod almost equal in length to merus, carpus and propodus together, and with a terminal lobe extending beyond insertion of the most distal of the setae .. 42.  
 Dactylus of second pereopod at most as long as carpus and propodus together, and with distal setae quite terminal .. .. 43.
42. Pseudorostrum relatively long, the lobes meeting for a distance equal to one-seventh length of carapace. Tubercles of carapace few and large .. .. *rostrata* Calman.  
 Pseudorostrum shorter, the lobes meeting for a distance equal to one-tenth length of carapace. Tubercles of carapace small and numerous .. .. *thetidis* sp. nov.
43. Merus of third maxilliped more than half as long again as carpus .. .. 44.  
 Merus of third maxilliped much less than half as long again as carpus .. .. *maculata* Zimmer.
44. Sides of carapace with three distinct folds, the uppermost two of which bear large rounded tubercles .. .. *intermedia* Hansen.  
 Sides of carapace without carinae but the depression bordered with rows of large conical tubercles .. .. 45.
45. Outer margin of merus of third maxilliped strongly dentate .. .. *horridioides* Stephensen.  
 Outer margin of merus of third maxilliped not dentate .. .. *horrida* Sars.

*CAMPYLASPIS THOMPSONI* sp. nov.

*Onigerous female.* Integument strongly calcified with the small reticulate patterning somewhat diffuse.

Carapace sparsely clothed with short hairs, without sculpture except for a very fine median line, and with pellucid spots on anterior portion; strongly vaulted above, ovoid in shape as seen from above, with greatest width nearly two-thirds its length, and equal to its depth; it is more than one-half the total length of the animal. Antennal notch and angle barely indicated. Pseudorostral lobes subtruncate in front and meeting for a distance about equal in length to ocular lobe which is as wide as long, subtriangular, barely at all constricted at base, and with three corneal lenses, the median, at anterior end, divided into two.

Pedigerous somites not elevated dorsally and pleural portions not prominent; first two almost wholly concealed.

Marsupium not visible from the side, the ova (0.275 mm. in greatest diameter) completely concealed beneath the bulging carapace.

Pleon somites with faint indications of dorso-lateral carinae; fifth without transverse sulcus; telsonic somite rounded distally and very little produced.

Second and third peduncular joints of first antenna subequal in length, each less than two-thirds as long as first; first segment of flagellum twice as long as second.

First maxilliped with terminal joint minute, with one tiny seta; a score of gill-leaflets plus one reflexed.

Terminal joint of second maxilliped with four falcate spines; the outermost small and crowded, the longest reaching to about level of tip of distal spine of penultimate joint.

Third maxilliped with basis wide and short, not quite as long as remaining joints together; merus two thirds as wide as long, as long as carpus, propodus and dactylus together, and with margins serrate, but with no outstanding dentation

although two small subdistal teeth on outer edge are rather prominent; carpus wider than propodus, but equal to it in length, with half a dozen teeth on inner margin and with two outer spines crowded together; propodus twice as long as dactylus and with three or four teeth on inner edge at proximal fourth.

First peracopod with basis about as long as rest of limb; merus three-fourths as long again as carpus which is subequal to propodus and twice as long as dactylus.

Second peracopod longer than first, with basis as long as ischium, merus and carpus together; dactylus subequal in length to carpus, with terminal setae insignificant.

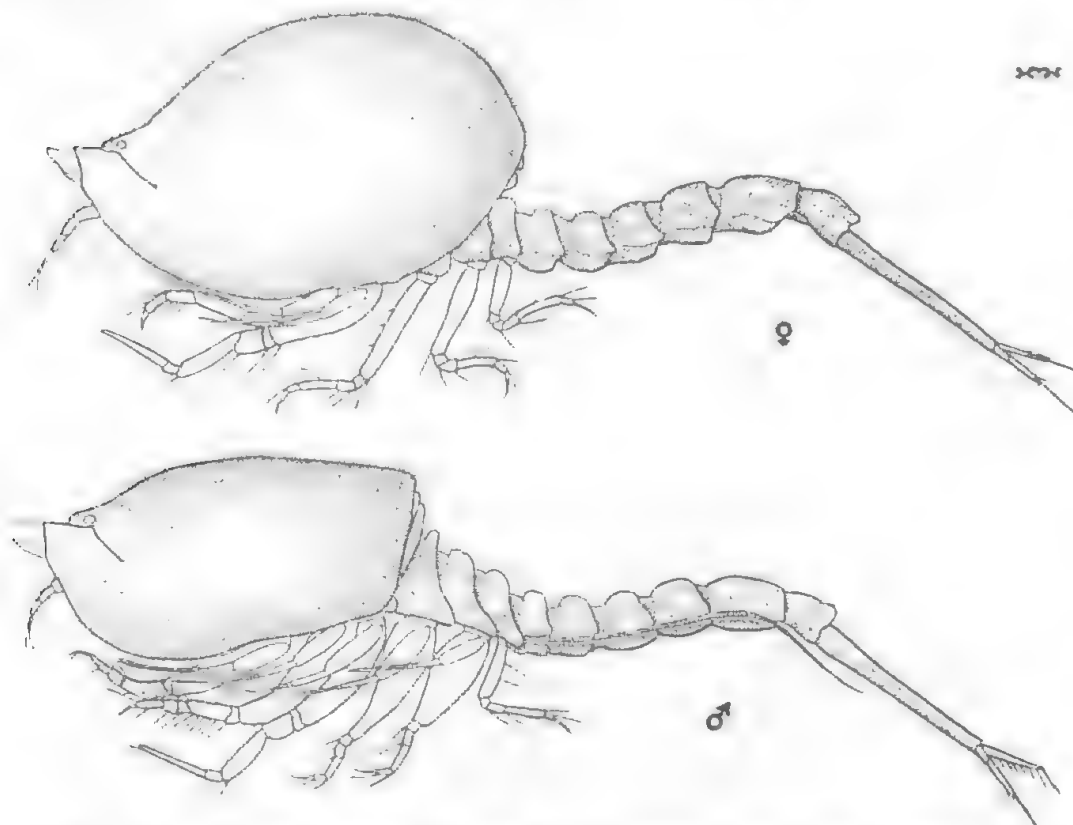


Fig. 24. *Campylaspis thompsoni*, types adult female and male from the side ( $\times 19$ ).

Peduncle of uropoda long and slender, three times as long as telsonic somite, three and one-half times as long as endopod and with inner edge serrate; endopod barely longer than exopod, with three spines on inner margin and two very unequal terminal spines, the longer more than half length of ramus; exopod with longest terminal spine equal in length to second joint.

Colour white.

Length 4.5 mm.

*Adult male.* Carapace less than half of total length of animal; its width is three-fifths its length and greater than its depth. Antennal notch even more completely obliterated than in female. Ocular lobe slightly larger, and rather more constricted at base; three corneal lenses.

Pedigerous somites three to five a little elevated dorsally and with pleural portions expanded and rounded.

Last joint of peduncle of second antenna more than twice as long as penultimate joint.

In the uropod the endopod is one-fourth as long again as the exopod and has seven spines, as well as minute spinules, on inner margin; peduncle three times as long as telsonic somite, and also as endopod, with plumose setae on inner edge.



Length 4.5 mm.

*Loc.* Tasmania: off Babel Island, lat. 39° 55' S., long. 148° 31' E. (type loc., "Warreen" Station 29, Jan., 1939). New South Wales: 4 miles off Pt. Hacking, 80 metres on mud (K. Sheard, trawled, May, 1944). Types in South Australian Museum, Reg. No. C. 2342-2343.

The New South Wales locality is based upon a single male which, though adult, is only 3.5 mm. in total length; in detail, however, it agrees closely with

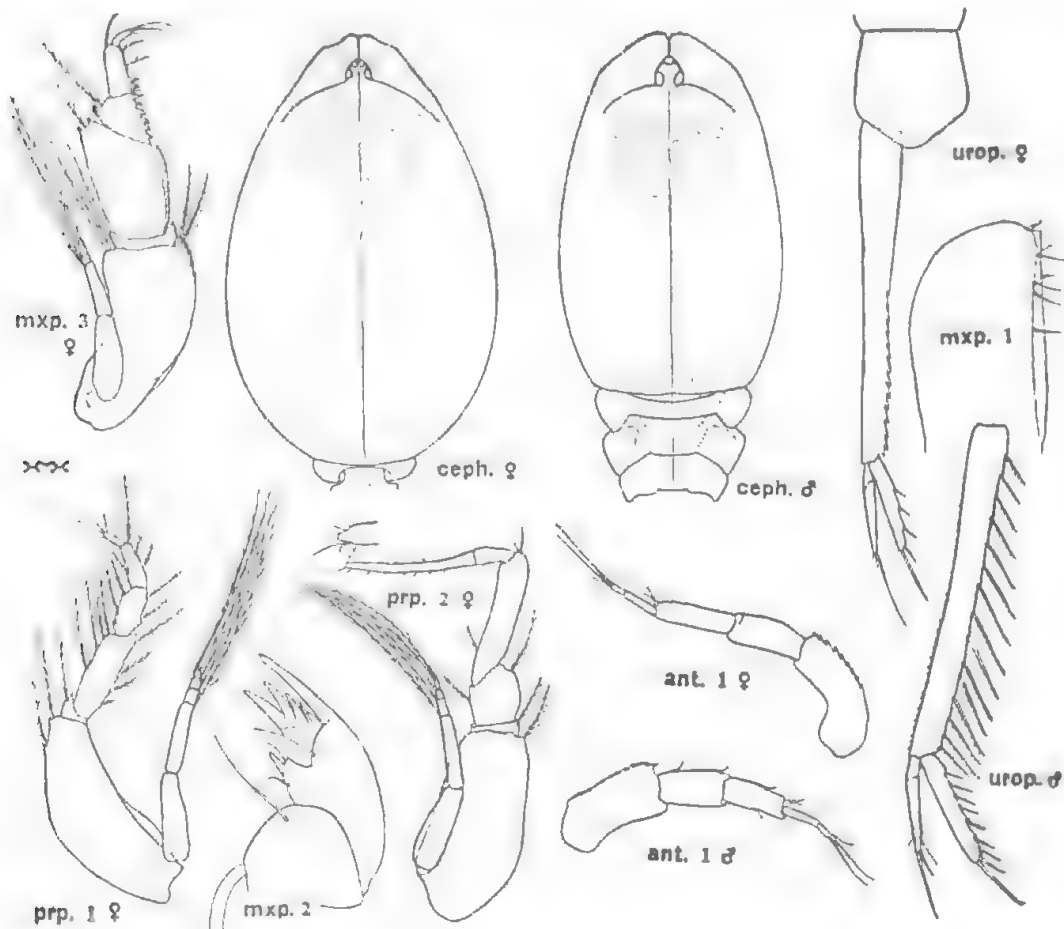


Fig. 25. *Campylaspis thompsoni*, ceph., cephalothorax of types female and male from above ( $\times 19$ ). Paratype female and male; mxp. 1-2, distal portions of first and second maxillipeds ( $\times 90$ ); ant., mxp. 3, prp. and urop., first antenna, third maxilliped, peraeopods and uropods ( $\times 34$ ).

the males from further south, the uropods being identical in the armature and length of peduncle, while the thoracic appendages exhibit no differences in the proportions of the joints.

*C. pacifica* Sars (1887, p. 66, pl. x, fig. 6) from the Philippines appears to be related but differs in the shape of the carapace, with wavy dorsal outline, the absence of corneal lenses, the well-defined antennal notch, the more exposed pedigerous somites, etc. The uneven dorsal contour of the carapace and the distinct antennal notch are both mentioned and figured by Sars, but information regarding the appendages is scanty.

Stebbing, in his key to the genus (1913, p. 188) separates his *paeneglabra* from allied species in that it has the carapace less than one-half the total length. *C. paeneglabra* was described from the male only and in the species described above the male differs from the female in this respect.

*C. thompsoni* resembles quite closely *glabra* Sars and *pauciglabra* Stebbing. In the last-named, however, the male eye-lobe shows no lenses, the dactylus of the second peracopods is longer than the carpus and propodus together, the rami of the uropoda are relatively much longer, etc.

*C. glaba* has the rami of the uropoda proportionately considerably longer, the first two pedigerous somites well produced dorsally and not almost wholly concealed in the female, while the basis of the second peracopod, according to Sars' figure, is relatively shorter.

This species is named after Dr. Harold Thompson, the Chief of the Fisheries Division of the Council for Scientific and Industrial Research.

**CAMPYLASPIS SIMILIS sp. nov.**

*Adult male.* Closely resembling the mature male of *thompsoni*.

First maxilliped with terminal joint minute, but distinct with a single seta; about a score of gill lamellae.

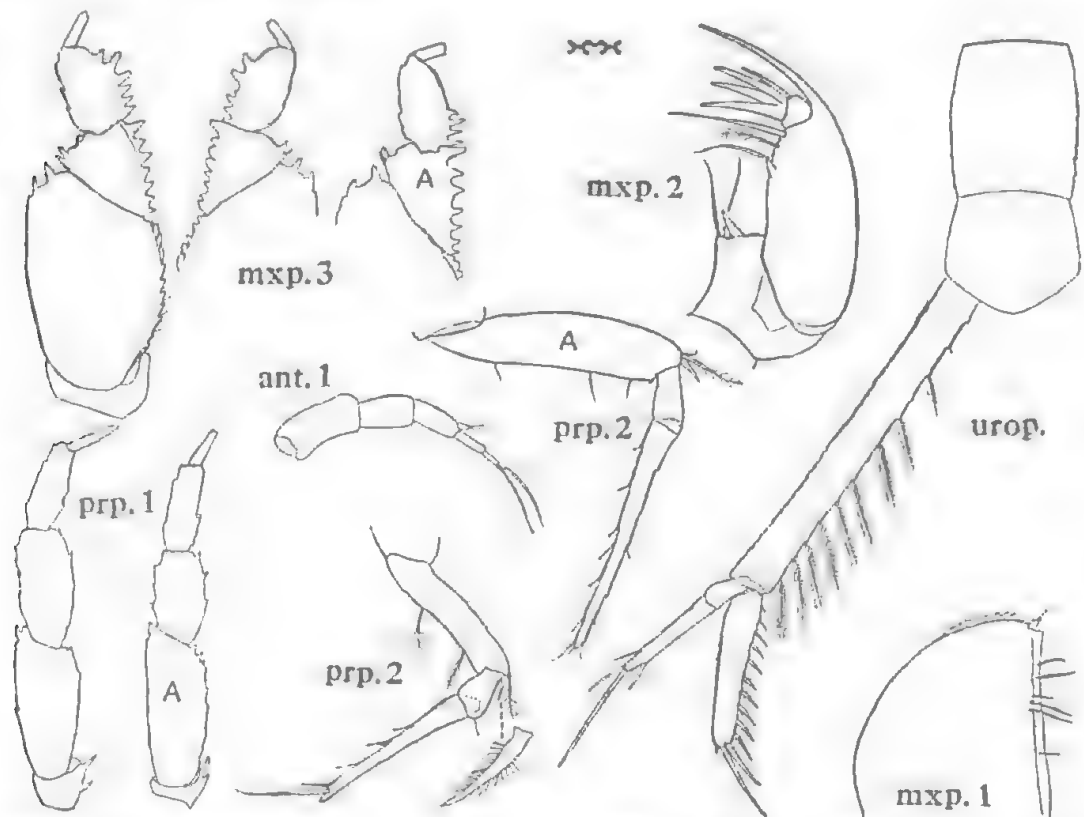


Fig. 26. *Campylaspis similis*, type male; ant. 1, first antenna ( $\times 60$ ); mxp. 1-2, terminal joints of first and second maxillipeds ( $\times 114$ ); mxp. 3 and prp., distal joints of third maxilliped, and first and second peracopods ( $\times 60$ ); urop., uropod with fifth pleon and telsonic somites ( $\times 42$ ). A, Distal joints of third maxilliped, and first and second peracopods, of adult male of *C. thompsoni* ( $\times 60$ ).

Plumose setae omitted on third maxillipeds and first peracopods.

Distal joint of second maxilliped with four spines; the outermost shorter and much more slender than the others, which are subequal in length; outer distal spine of penultimate joint slender, curving well beyond the terminal spines; opposite this at inner margin is a very stout distal seta followed by a plumose and a plain slender seta.

Third maxilliped much as in *thompsoni* but a little broader and with inner edge of propodus serrate for greater part of length.

First pereopod with merus only one-third as long again as carpus, which is much longer than propodus and twice as long as dactylus.

Dactylus of second pereopod almost as long as carpus and propodus together, and with longest terminal seta half as long as the joint.

Peduncle of uropod three times as long as the short, broad and little produced telsonic somite, but only two and one-fourth times as long as endopod; with spaced plumose setae on inner margin; endopod with three terminal spines, the outermost very small, and with nine or ten spines on inner margin; exopod a little shorter than endopod with the longest of its two terminal spines fully as long as its second joint.

Colour white.

Length 3.8 mm.

*Loc.* Tasmania: off Babel Island, lat. 39° 55' S., long. 148° 31' E. ("Warren" Station 29, Jan., 1939). Type in South Australian Museum, Reg. No. C. 2566.

*C. similis* may be separated from *thompsoni* without dissection by the different proportions of the joints of the first pereopod and by the shorter peduncle of the uropod.

*CAMPYLASPIS UNISULCATA* sp. nov.

*Adult male.* Integument calcified and brittle, with reticulate pattern small, rather diffuse on carapace and of somewhat imbricate appearance on pleon.

Carapace with obscure, very fine median dorsal line; smooth on sides excepting for a single longitudinal, faint, slightly curved furrow running from neighbourhood of antennal notch to about four-fifths of the length; depressed and with dorsal margin little arched; fully twice as long as deep, and distinctly less than half

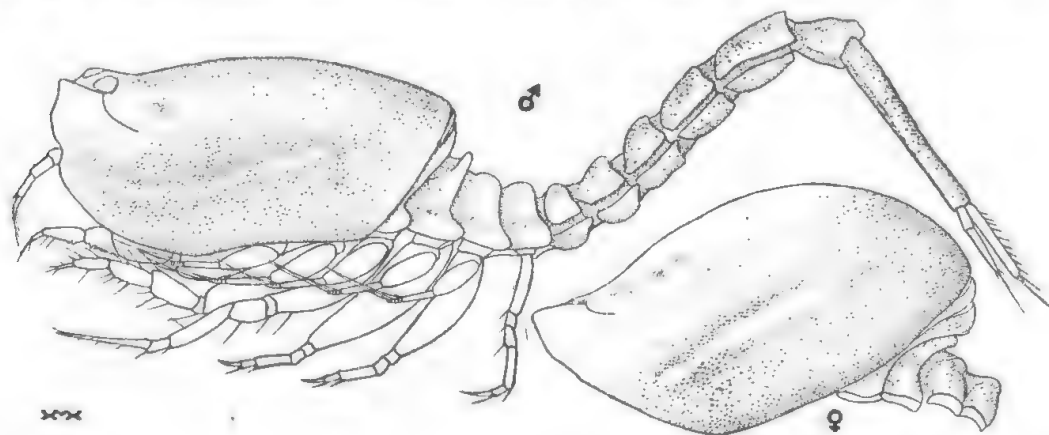


Fig. 27. *Campylaspis unisulcata*, type male and cephalothorax of paratype female ( $\times 23$ ).

the total length of animal; viewed from above it is suboval in shape with the anterolateral areas below the lateral groove prominent, while the sides are not quite evenly curved but slightly sinuate. Antennal notch shallow, smoothly concave; below it the margin is rounded, not at all angular. Pseudorostral lobes subtruncate and slightly concave in front, meeting for a distance equal to about half length of ocular lobe, which is rounded, large, rather wider than long and with three prominent lenses arranged in a triangle, the hinder ones situated at and beyond the postero-lateral parts of the lobe.

First pedigerous somite concealed excepting for a narrow dorsal strip; it and the second elevated dorsally and with anterior margin as seen from above slightly produced forwards and angular medianly; third a little elevated posteriorly on the back; fourth and fifth somites with a pair of low longitudinal dorsal ridges; pleural parts of second to fifth rounded, not much expanded backwards.

Pleon with very fine dorsal longitudinal line on fifth and telsonic somites; fifth without transverse sulcus; telsonic somite as wide as long, rounded posteriorly, but scarcely at all produced, and only about as long as wide.

First peduncular joint of first antenna longer than third, which is longer than second; flagellum with terminal (second) joint much shorter than first and with a brush of sensory setae.

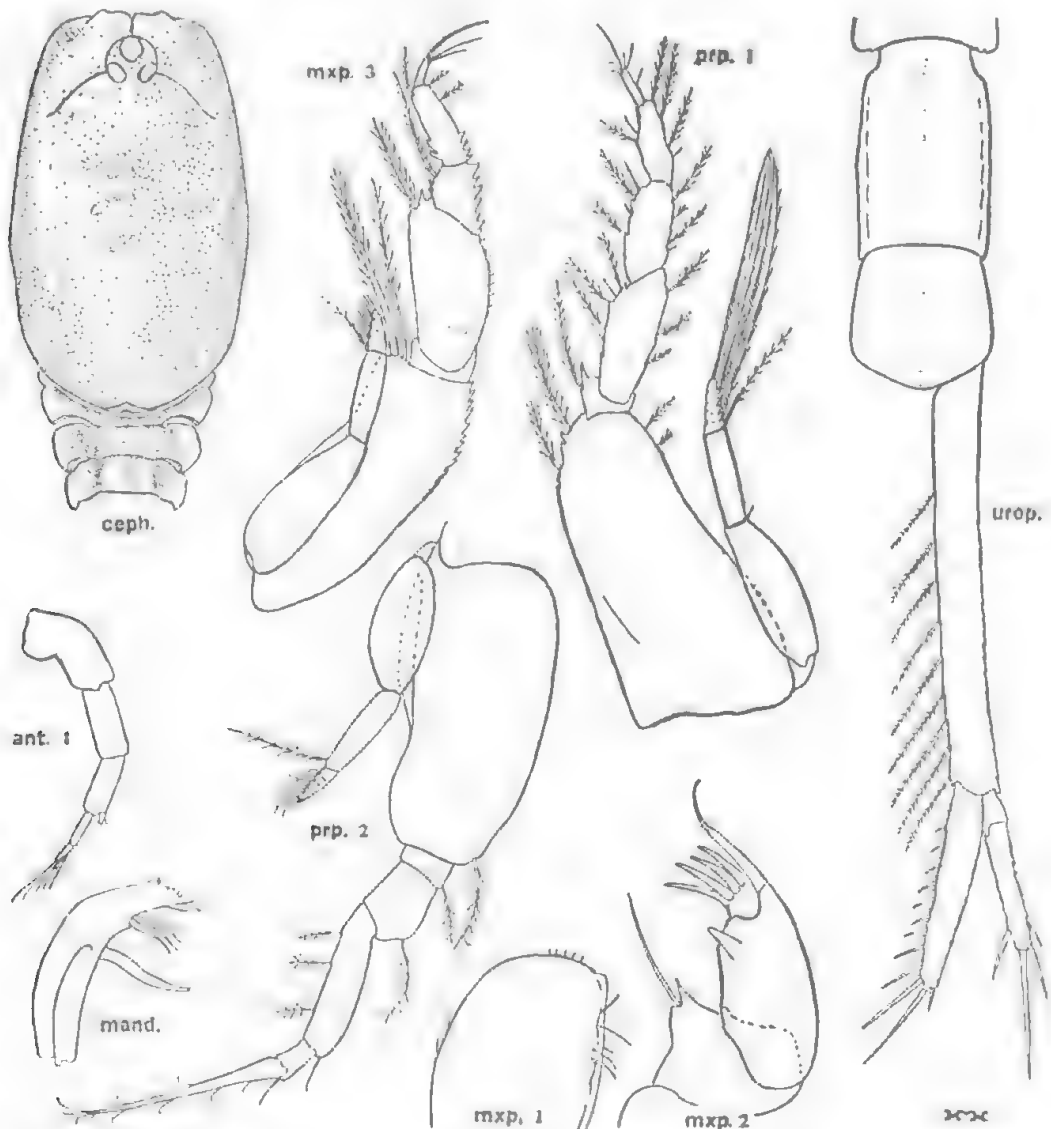


Fig. 28. *Campylaspis unisulcata*, type male; ceph., cephalothorax from above ( $\times 23$ ); ant. and mand., first antenna and mandible ( $\times 70$ ); mxp. 1-2, distal portions of first and second maxillipeds ( $\times 130$ ); mxp. 3 and prp., third maxilliped and peraeopods ( $\times 60$ ); urop., uropod with fifth pleon and telsonic somites ( $\times 60$ ).

Second antenna with last segment of peduncle fully twice as long as penultimate.

Mandible with three stout spines in the row and with the slender molar process almost half as long as the incisor part distal to it.

First maxilliped with terminal joint so minute that it is difficult to discern.

Terminal joint of second maxilliped with four spines, subequal in length, each about half as long as distal outer spine of penultimate joint; the last named spine is slender and flexible distally.

Third maxilliped stout; basis serrate on distal part of inner edge and almost as long as rest of limb; merus fully twice as long as wide, almost as long as carpus, propodus and dactylus together, with inner margin crenulate and outer with two subdistal spines, in between which is the usual plumose seta; carpus coarsely serrate on inner edge and with a pair of small teeth on outer margin; propodus three times as long as dactylus and about one-fifth longer than carpus, with about four inner teeth close together and two outer teeth, all in proximal half.

First pereopod with the wide basis subequal in length to rest of limb; ischium with a strong inner tooth, rest of joints not regularly serrate; merus about one-third as long again as carpus; propodus not much shorter than carpus and twice as long as dactylus.

Second pereopod longer than first, with the wide basis longer than ischium to propodus together; dactylus markedly tapering, as long as carpus and propodus together, and with terminal setae short and slender.

Peduncle of uropod with insignificant serrations on outer margin and nine setae (with short plumes) on inner margin, it is three times as long as telsonic somite and slightly more than twice as long as endopod; exopod four-fifths as long as endopod, with longest of two terminal spines as long as its second joint, with a subdistal inner spine and two, slender, on the outside edge; endopod with ten inner spines (type as in *rupta*, *thompsoni*, etc.) successively increasing in length, the last five times longer than first; longest of the two very unequal terminal spines of endopod only half as long as ramus.

Colour, white, tinged with brown at anterior end of carapace.

Length 3.9 mm.

*Subadult female.* A single example with uropods abnormal, has the carapace well-arched above and not depressed as in the male; it is not quite twice as long as deep and is a little more than half the total length of animal; it bulges backwards to the rear but does not overhang the dorsum of the pedigerous somites.

Length 3.6 mm.

*Loc.* South Australia: St. Vincent Gulf, Rapid Bay, 4 fath., on mud (type loc. H. Cooper, E. J. Hanka and A. Rau, Jan., 1944). Tasmania: off Babel Island, lat. 39° 55' S., long. 148° 31' E. ("Warreen" Station 29, Jan., 1939). Type, male, in South Australian Museum, Reg. No. C. 2562.

This species shares with the Californian *canaliculata* Zimmer 1936, p. 427, fig. 35) the distinction of possessing a depression on the side of the smooth carapace not margined by folds. The maxillipeds are very similar in Zimmer's species although the terminal joint of the first pair is less rudimentary; the dactylus of the second pereopod, however, is dilated apically and bears no terminal setae, whereas in *uniusulcata* this joint is longer, tapers to a rather unusual degree, and has terminal setae. The joints of the first pereopods are also of different proportions; in *canaliculata* the "carpus and propod. are of nearly equal length", and are so shown in Zimmer's fig. 35 j, but in *uniusulcata* the carpus is distinctly longer than propodus.

#### CAMPYLARPIA UNIPPLICATA sp. nov.

*Female.* Integument calcified, brittle and fragile; very short setae over whole of body.

Carapace with a single rounded carina on each side, running from the neighbourhood of the antennal notch obliquely upwards and terminating at second third of length just before reaching the mid-line of the back; lower and parallel to this ridge is a feeble longitudinal gutter but no distinct second ridge; a low, double, antero-lateral tumidity on each side and an insignificant median longitudinal line on back; otherwise smooth except for the very fine reticulation and faint wavy, oblique striae; there are a few elongate pellucid spots, arranged in a trans-

verse row, at first fourth of length; back, as seen from the side, sinuate and rising steeply to about first third of length, thence evenly and strongly arched; seen from above the width is two-thirds the length and the pseudorostrum is irregular laterally, thence the sides are evenly curved; the total length of the carapace is less than that of the pleon. Pseudorostral lobes oblique, pointed in front and meeting for a distance greater than length of eye-lobe, which is roundly subtriangular, as wide as long, with three corneal lenses, the apical lens divided into two. Antennal notch a shallow concavity and angle widely rounded.

Pedigerous somites scarcely elevated dorsally, the second to fifth with pleural parts globose and rounded posteriorly.

Pleon somites with no definite sculpture, save for two or three eroded areas on each side of first to fifth; telsonic somite as wide as long, a little widened posteriorly, rounded distally and not much produced.

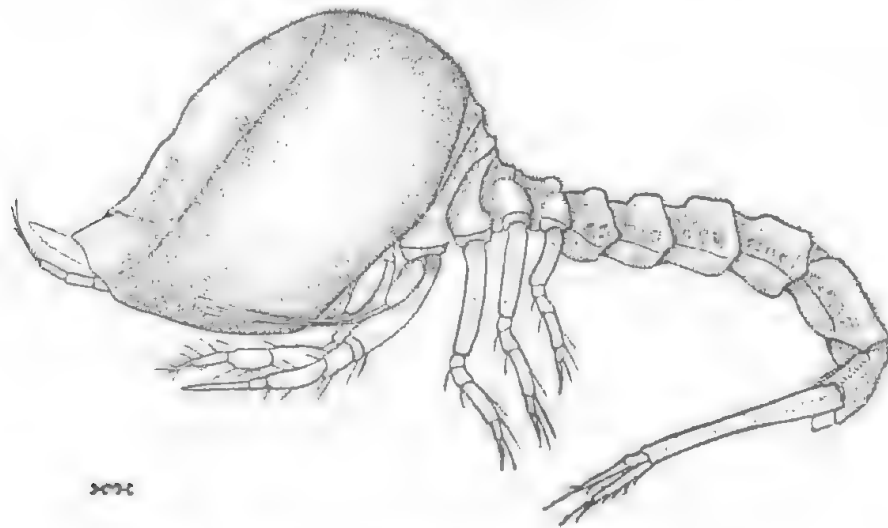


Fig. 29. *Campylaspis uniplicata*, type female ( $\times 21$ ).

Second and third peduncular joints of first antenna subequal in length, each not much longer than first and shorter than the slender flagellum, the first segment of which is longer than the second.

Second antenna single-jointed. Upper lip rather long.

First maxilliped with terminal joint elongate, minute, with a single seta; twenty-one gill-lobes on epipod.

Last joint of second maxilliped with four spines, three subequal, the fourth shorter and more slender; penultimate joint with two distal setae and with the outer spine stout and reaching beyond tips of dactylar spines.

Third maxilliped with basis very short, only as long as ischium, merus and carpus together; merus large, nearly twice as long as wide, a little longer than carpus and propodus together and with three outer teeth near distal end; carpus as wide as long, three-fourths as long as propodus and with small denticles on short outer edge.

First pereopod without definite dentition; basis much shorter than rest of limb; merus one-third as long again as carpus, which is longer than propodus.

Second pereopod a little longer than first; basis short, as long as ischium to propodus together; dactylus a little longer than carpus with insignificant setae as in *thompsoni*.

Peduncle of uropod long slender, serrate on inner margin, almost three times as long as telsonic somite, and three times as long as rami, which are subequal in

length; endopod with four composite spines on inner edge and two unequal terminal spines, the longer three-fourths as long as the ramus; exopod with one inner spine and with the longer of the two terminal spines longer than the second joint, and than that of endopod.

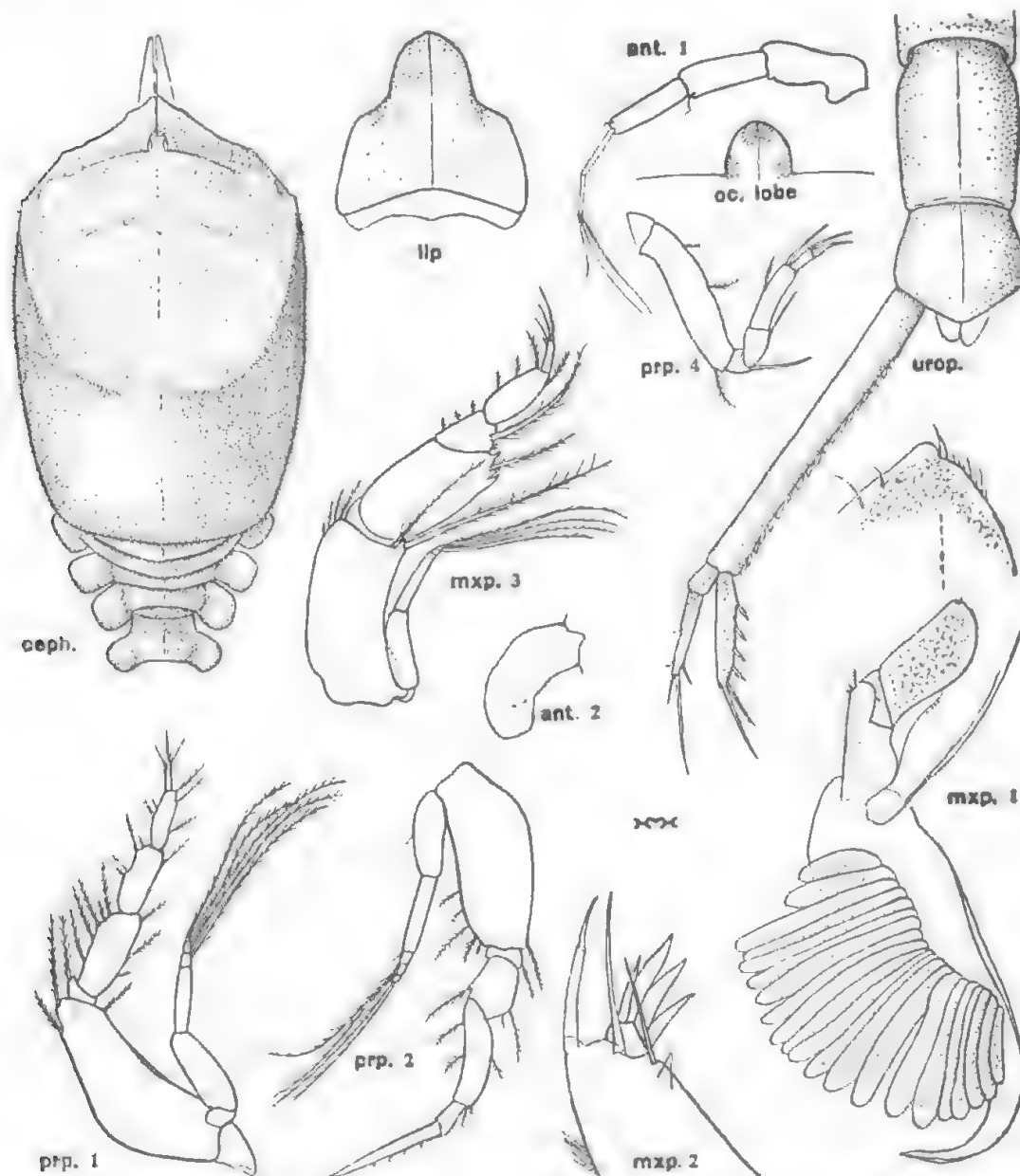


Fig. 30. *Campylaspis uniplicata*, type female; ceph., cephalothorax from above ( $\times 22$ ); oc. lobe, lip and ant., ocular lobe, upper lip and antennae ( $\times 62$ ); mxp., first to third maxillipeds ( $\times 62$ ); prp., peraeopods ( $\times 32$ ); urop., uropod with fifth pleon and telsonic scimites ( $\times 32$ ); distal portions of first and second ( $\times 144$ ).

Colour milk white without trace of pigment.

Length 4.8 mm.

*Loc.* New South Wales: 5 miles east of Port Hacking, 100 metres, on mud (type loc., "Cronulla" Trawl Station, July, 1943); 4 miles east of Port Hacking, 80 metres, on mud (K. Sheard, trawled, May, 1944). Type in South Australian Museum, Reg. No. C. 2522.

A smaller female, 3.1 mm. in total length, has the dorsum of the first and second

pedigerous somites almost perpendicular as seen from the side and not even slightly elevated; the appendages, etc., are as in the type.

Apart from *platyropus* Calman (1911, p. 364, pl. xxxiv, fig. 25-29), this is the only known unicarinate member of the genus.

*CAMPYLASPIS RUPTA* sp. nov.

*Adult male.* Integument not strongly calcified, not brittle but tough and not easily torn.

Carapace with strong sculpture, consisting of shallow depressions with tumid edges; the largest excavation is lateral, above it are two dorso-lateral depressions in posterior half; anterior to it is an excavation behind the antennal area and immediately above it is a small hollow (fig. 31), the mid-line is ridged and irregular, so

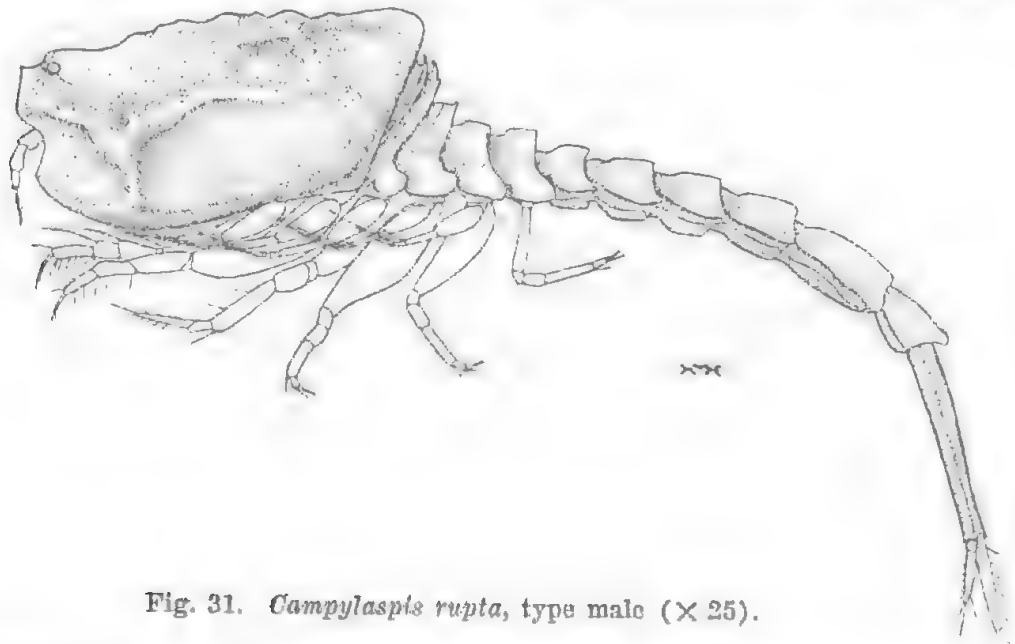


Fig. 31. *Campylaspis rupta*, type male ( $\times 25$ ).

that seen from the side the dorsal contour is markedly uneven, slightly arched and somewhat concave at base of ocular lobe; viewed from above it is widest in posterior third but is considerably broadened anteriorly owing to a large tumidity at the upper anterior part of the largest lateral depression; it is two-fifths of the total length of the animal, depressed and twice as long as deep. Antennal notch widely open and angle obtuse. Ocular lobe rounded, wider than long with three distinct corneal lenses arranged in a triangle and a further conjoined pair, less distinct, on each side.

First to third pedigerous somites each with a transverse carina, medianly sharply elevated and with a pair of small tubercles; fourth and fifth somites each with a pair of longitudinal dorsal carinae.

Pleon narrow; first four somites each with a pair of dorsal carinae as in posterior pedigerous somites. Fifth somite slightly constricted at two-thirds of length as seen from above but with no transverse sulcus; from the side no constriction is apparent but there is a slight ventral indentation at this point; this somite has a median longitudinal carina, most distinct on posterior half: telsonic somite produced more than usual in genus, with apex rather narrowly rounded, and with median carina; it is much longer than wide.

First joint of peduncle of first antenna as long as second and third segments together; flagellum two-jointed, as long as third peduncular joint and shorter than second.



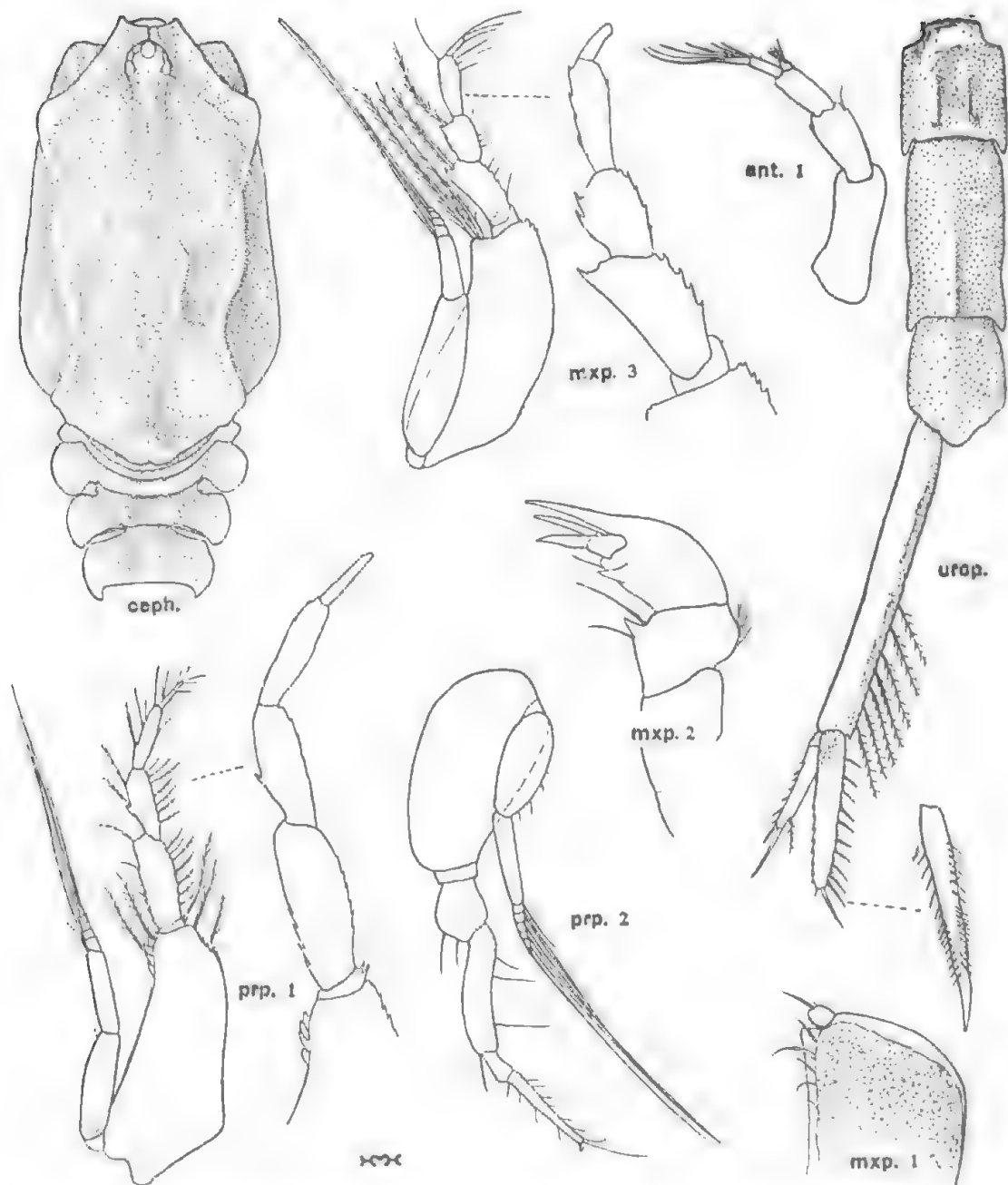


Fig. 32. *Campylaspis rupta*. ceph., Cephalothorax of type male from above ( $\times 272$ ). Para type male; ant. 1, first antenna ( $\times 100$ ); mxp. 1-2, distal portions of first and second maxillipeds ( $\times 140$ ); mxp. 3, and prp., third maxilliped and peracopods ( $\times 50$ ; distal portions with plumose setae omitted,  $\times 100$ ); urop., uropod with fifth pleon and telsonic somites ( $\times 50$ ).

Second antenna with last segment of peduncle one and three-fourths times as long as penultimate.

First maxilliped with terminal joint small, only about one-sixteenth of length of penultimate, globose and capped with a seta longer than itself and a minute seta.

Distal joint of second maxilliped with two spines, one slightly longer than the other and not reaching quite to tip of outer spine of penultimate joint.

Third maxilliped with basis stout and longer than rest of limb; merus widest distally, less than twice as long as wide, much shorter than carpus and propodus.

together, with a prominent subdistal outer tooth and with inner margin serrate, carpus wider than, and five-sixths as long as, propodus, with inner margin serrate and with two teeth on outer edge; dactylus much less than half as long as propodus.

First peraeopod with rather prominent closed serrations at distal end of outer margin of basis, which is as long as the rest of the limb; ischium with two small inner teeth; merus much longer than carpus and with both margins partly serrate; carpus little longer than propodus, with a tooth at middle of length of outer margin; dactylus more than half as long as propodus.

Second peraeopod a little shorter than first, with the stout basis as long as ischium to propodus together; dactylus little more than three-fourths as long as carpus and much longer than its longest terminal seta.

Peduncle of uropod carinate, as long as fifth pleon and telsonic somites together, twice as long as endopod, and with plumose setae on distal half of feebly serrate inner margin; endopod half as long again as exopod, with two very unequal terminal spines and an inner row of ten, all compound (see fig. 32, urop.); exopod with row of spines on outer edge, two unequal terminal spines and a single plumose seta on inner margin.

Colour, yellow, generously mottled with dark brown on thorax, pleon and all exposed appendages. No attempt is made to show the patterning in fig. 31, as this would confuse the sculpturing.

Length 4 mm.

*Loc.* South Australia: St. Vincent Gulf, Brighton, off jetty, 1-2 fath. (Misses Pat. Mawson and L. M. Angel, and K. Sheard, submarine light, Oct. 1941) Type in South Australian Museum, Reg. No. C. 2560.

The bold sculpture is distinctive. Most if not all of the other Australian species of *Campylaspis* were taken on mud, the type of bottom which would be expected for the genus, but *rupta* was on clean white sand; there are, however, patches of silt here and there in the Gulf and only two males of this species were secured by the collectors.

#### CAMPYLASPIS LATIDACTYLA sp. nov.

*Non-ovigerous female.* Integument well calcified, coarsely pitted-reticulate on carapace; granulate on pedigerous and pleon somites, and on basal joints of peraeopods and uropods.

Carapace with a single deep, wide curved furrow on each side, margined above and below with a low fold; broad, a little wider than deep, fully half as long again as depth, and less than half of total length of animal; dorsally it is moderately arched and does not at all overhang the pedigerous somites posteriorly; seen from above it is broadest across the lower of the lateral folds, which are well-separated on the back. Antennal notch and angle obsolete. Pseudo-rostral lobes truncate anteriorly, meeting for a distance equal to length of ocular lobe, which is rounded, wider than long, and has three corneal lenses.

Pedigerous somites all exposed and, like carapace, with a fine median carina; together they are not much more than two-fifths as long as carapace; dorsally each is tumid, but not produced; pleural portions globose, not produced backwards.

Fifth pleon somite without transverse sulcus, barely longer than wide, and little longer than telsonic somite, which is dilated laterally towards the distal end, is wider than long and has the hinder margin broadly rounded and scarcely produced.

First joint of peduncle of first antenna nearly half as long again as second which is longer than third.

Terminal joint of second maxilliped with three spines, subequal in length, but one much more slender than the others; penultimate joint with outer distal spine

long, reaching for one-third of its length beyond dactylar spines and with distal part tapering and flexible; this joint also bears two subdistal spines as well as the usual triangular tooth and a strong seta.

Third maxilliped almost as long as first peraeopod; basis as long as merus, carpus and propodus together; merus nearly twice as long as wide, longer than carpus plus propodus, and with no armature save a couple of feeble subdistal outer teeth; propodus one-fourth as long again as carpus and barely twice as long as dactylus.

First peraeopod with basis two-thirds as long as rest of limb; merus half as long again as carpus, which is equal in length to propodus and less than twice as long as dactylus.

Second peraeopod longer than first, with basis stout and not much longer than merus and carpus together; ischium indistinct; dactylus a little longer than carpus and distinctive in structure, being dilated distally, with a single short clavate, articulated process (evidently a modified seta) inserted near the terminal end (see fig 34, dactylus).

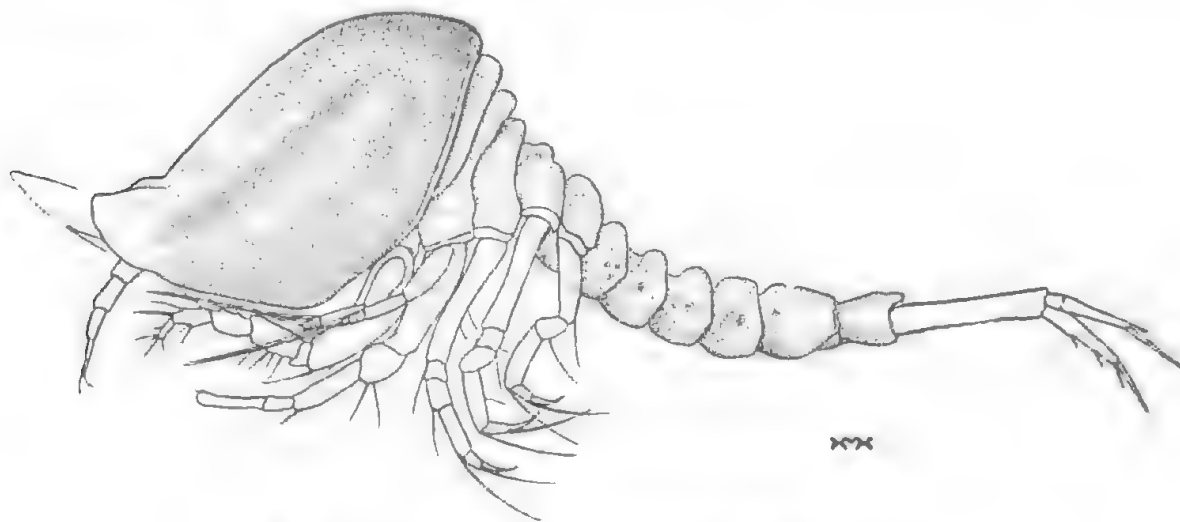


Fig. 33. *Campylaspis latidactyla*, type female ( $\times 40$ ).

Third to fifth peraeopods with the carpal seta and propodal seta long, each reaching very much beyond tip of dactylus.

Peduncle of uropod serrate on inner edge, more than twice as long as telsonic somite and not quite twice as long as endopod, which is equal in length to the exopod; endopod with two spines on inner margin and two distal spines, one of which is more than twice as long as the other and fully two-thirds as long as the ramus; longer of the two very unequal terminal spines of exopod as long as second joint of the ramus.

Colour, white with numerous dark ocelli on carapace and pedigerous somites, and a few on anterior pleon somites and basis joints of peraeopods.

Length 2.2 mm.

*Loc.* Queensland: Moreton Bay, Myora Bight, surface (I. S. R. Munro, Stations 45 and 55 [type loc.], 50 cm. 40 m. net, 10.30 p.m. on Nov. 29, 1940 and 9.40 p.m. on Dec. 6, 1940). Type in South Australian Museum, Reg. No. C. 2618.

A female was taken at each station; the paratype is 2-6 mm. in length and differs from the type in having three inner spines on endopod of uropod and in having more of the first pedigerous somite concealed beneath the carapace, which is granulate instead of pitted.

Amongst the Australian species with a single furrow on the side of the carapace this species stands apart by the curious dactylus of the second leg; there is a similar modification in *canaliculata* Zimmer (1936, p. 427, fig. 35) but there the subterminal seta is slender and plumose while the fainter longitudinal sulcus of the carapace, and the dorsally well produced first and second pedigerous somites serve readily to separate it.

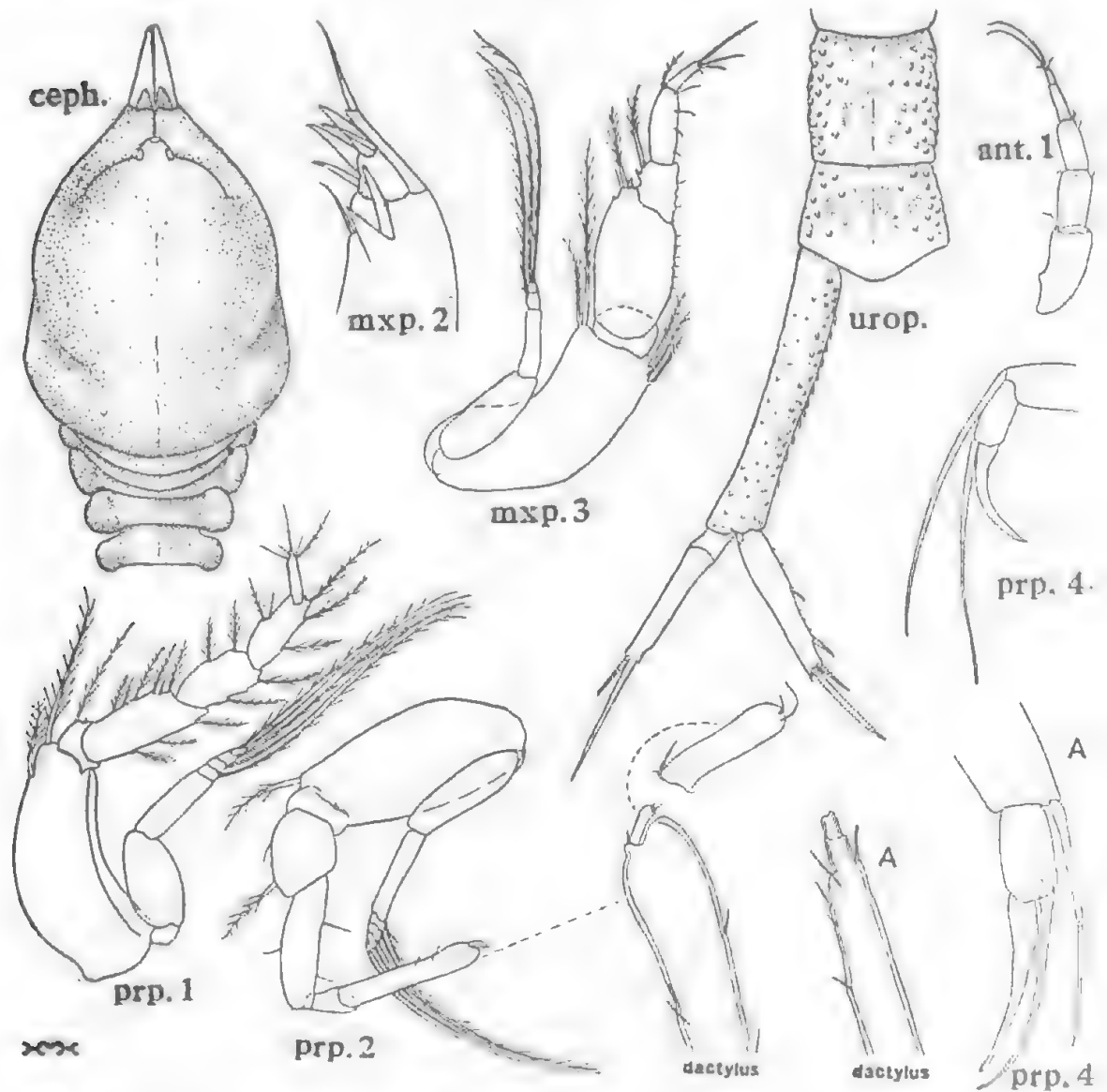


Fig. 34. *Campylaspis latidactyla*, type female; ceph., cephalothorax from above ( $\times 39$ ); ant. 1, first antenna ( $\times 77$ ); mxp. 2, distal portion of second maxilliped ( $\times 240$ ); mxp. 3 and prp. 1, third maxilliped, and first and second peraeopods ( $\times 77$ ); dactylus, distal half of dactylus of second peraeopod ( $\times 240$ ; terminal "seta",  $\times 720$ ); prp. 4, distal portions of fourth peraeopod ( $\times 126$ ); urop., uropod with fifth pleon and telsonic somites ( $\times 77$ ). A, *Campylaspis uniplicata*; distal half of dactylus of second peraeopod ( $\times 240$ ); distal joints of fourth peraeopod ( $\times 126$ ).

The dactylus of the second leg of *uniplicata* sp. nov. while tapering to the apex and not at all dilated, bears a truncate terminal process instead of slender setae (cf. fig. 34, A); this species has the lateral furrow very faint but has an upper carina which extends further back than in *latidactyla*, has short fossorial setae on the posterior legs, etc.

## CAMPYLASPIS MINOR sp. nov.

*Ovigerous female.* Integument somewhat rugose, with faint reticulate patterning.

Carapace with a well-marked, curved, lateral impression on the side, margined above and below by a low fold; the folds are widely separated on the back; dorsal margin strongly arched and bulging; it is less than twice as long as deep, about as wide as long, and is half the total length of the animal; viewed from above it is ovoid in shape (the lateral impressions noticeably affecting the outline) and the antero-lateral margins slope backwards very obliquely from the pseudorostrum. Antennal notch and angle obsolete. Pseudorostral lobes somewhat pointed in front.

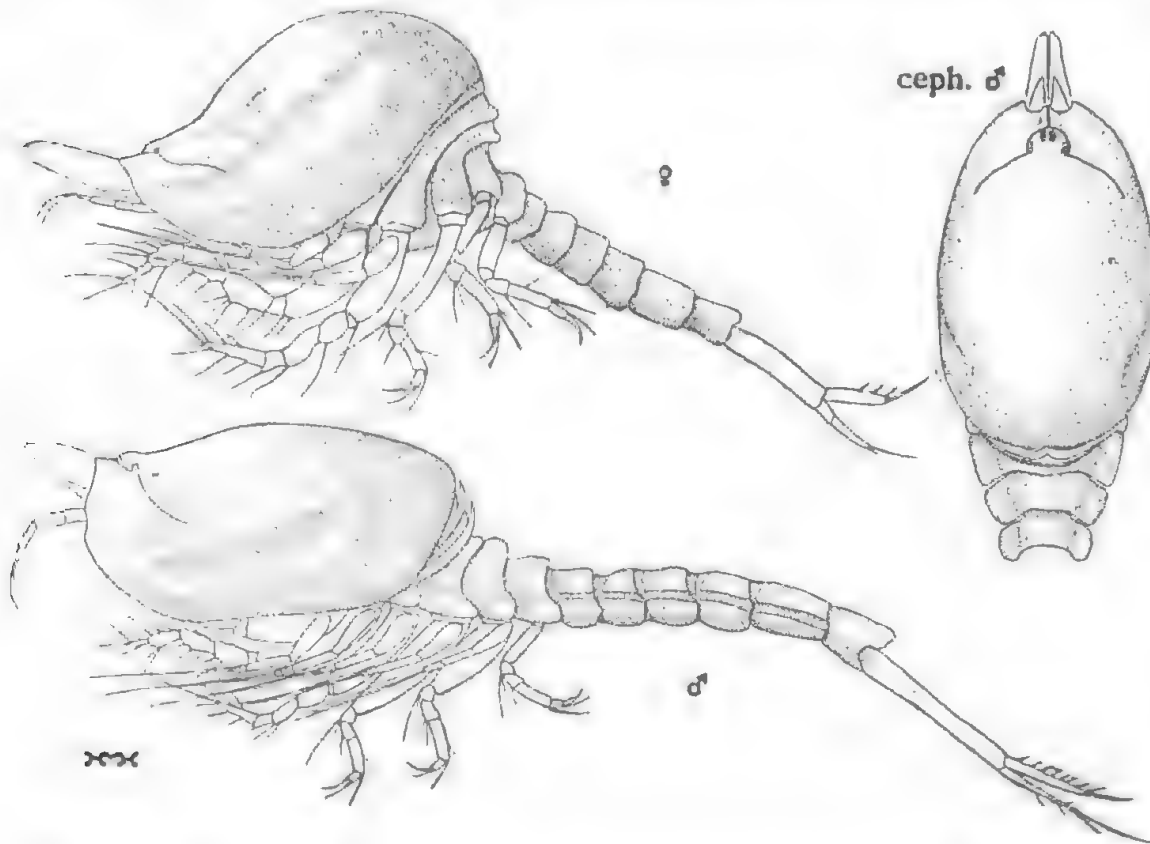


Fig. 35. *Campylaspis minor*; lateral view of type ovigerous female ( $\times 60$ ); lateral view and (ceph.) dorsal view of cephalothorax of paratype male ( $\times 40$ ).

as seen from the side as well as from above, meeting for a distance equal to length of ocular lobe. There are three pale lenses in the ocular lobe, which is rounded and as wide as long.

First pedigerous somite exposed as a narrow strip; posterior half of dorsum of second and third elevated transversely, the tumidity rounded and not at all prominent; pleural portions of somites swollen, but not much expanded backwards; together these somites are little more than one-third as long as carapace.

Pleon two-thirds as long as carapace, the somites short and stout; telsonic somite rounded posteriorly, much wider than long and not much shorter than the fifth, which has no transverse sulcus and is fully as wide as long.

First antenna slender; third peduncular joint nearly one-third as long again as second, but shorter than first. Second antenna two-jointed, not much longer than first joint of peduncle of first pair.

Terminal joint of second maxilliped with four long spines, three subequal in length, one a little shorter, none reaching level of apex of distal outer spine of penultimate joint.

Third maxilliped wide and large, equal in length to the first peraeopod; basis about four-fifths as long as rest of limb; merus widest distally (where its breadth is not very much less than its length) and not quite as long as carpus and propodus together; carpus a little shorter than propodus, with three blunt inner teeth; propodus more than twice as long as the short dactylus, with three rounded teeth on inner side near proximal end.

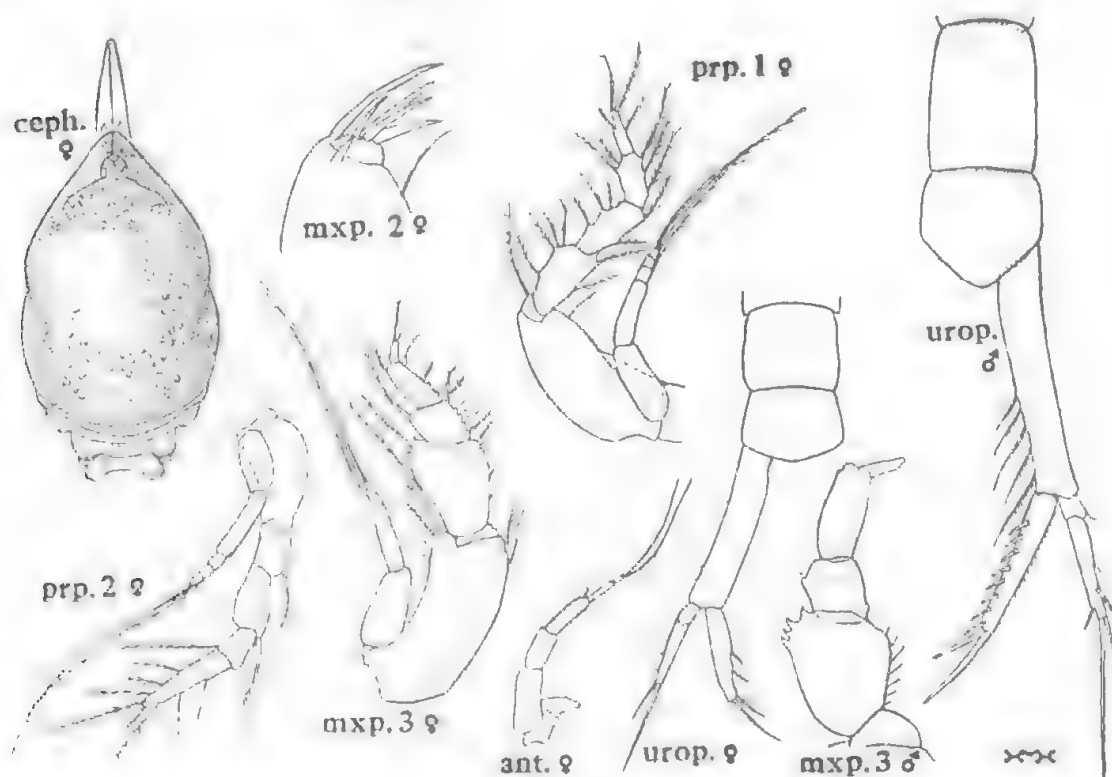


Fig. 36. *Campylaspis minor*. Type ovigerous female; ceph., cephalothorax from above ( $\times 37$ ); ant., first and second antennae ( $\times 80$ ); mxp. 2, distal portion of second maxilliped ( $\times 230$ ); mxp. 3 and prp., third maxilliped and peraeopods ( $\times 80$ ); urop., uropod with fifth pleon and telsonic somites ( $\times 80$ ). Paratype male; mxp. 3, distal portion of third maxilliped, with plumose setae omitted ( $\times 105$ ); urop., uropod with fifth pleon and telsonic somites ( $\times 80$ ).

First peraeopod with basis considerably shorter than rest of limb; merus a little longer than carpus; propodus shorter than carpus and not much longer than dactylus.

Second peraeopod not quite as long as first, with basis short, less than half as long as rest of limb; ischium fairly distinct; dactylus stout, tapering to distal end, much longer than carpus but shorter than carpus plus propodus, and with long plumose setae, the longest terminal one longer than the joint.

Fossorial setae of posterior peraeopods short, not reaching beyond apex of dactylus.

Peduncle of uropod fully twice as long as telsonic somite and less than twice as long as endopod; exopod almost as long as endopod, with one of the two unequal distal spines as long as the ramus; endopod with two spines on inner margin and two unequal terminal spines, the longer of which is about three-fourths as long as the ramus.

Colour, yellow, the carapace with a few isolated brown spots, one near postero-lateral corner, one near end of pseudorostral suture, and one over branchial region on each side, also a pair of dorsal spots near hind margin; basis of third and fourth pereopods with a brown spot.

Length 1.2 mm. Ova 0.19 mm. in greatest diameter. Other females 1.4 mm.

*Adult male.* Carapace slightly depressed, almost twice as long as deep, less than half total length of animal, and with dorsal margin scarcely arched; lateral furrow distinct. Pseudorostral lobes subtruncate in front.

First and second pedigerous somites elevated and curving slightly forwards on the back, medianly angular; pleural portions of first concealed, of second to fifth swollen and slightly produced backwards; dorsum of third to fifth somites somewhat tumid.

Pleon as long as carapace; telsonic somite rather angularly rounded posteriorly, as long as wide, produced over bases of uropods, and distinctly shorter than fifth somite, which is wider at posterior end than it is anteriorly, and is nearly half as long again as wide.

Second maxilliped as in female. Third maxilliped with merus rather more robust, and distinctly shorter than carpus and propodus together.

Pereopods, except for larger basis, of same proportions as in female; longest terminal seta of dactylus of second pereopod as long as propodus and dactylus together.

Peduncle of uropod fully twice as long as telsonic somite and less than twice as long as endopod, with several setae, increasing successively in length, on distal half of inner margin; exopod shorter than endopod, with the longest of its two unequal terminal spines longer than the whole ramus; endopod with a row of seven spines on inner margin and with the longer distal spine two-thirds as long as ramus.

Colour as in female.

Length 1.9 mm. Other adult males 1.5 mm. to 1.7 mm.

*Loc.* Queensland: Moreton Bay, Myora Bight, surface (I. S. R. Munro, Stations 28, 29, 44 [type loc.] and 46, 50 cm. 40 m. net, 2.30 a.m., 3.30 a.m., 9.30 p.m. and 11.30 p.m., Nov. 29, 1940), and in shallow water over coral patch (I. S. R. Munro, Station 55, 50 cm. 40 m. net, 9.40 p.m., Dec. 6, 1940); Noosa River, below Gympie Terrace, surface (I. S. R. Munro, Station T.44.1, 50 cm. 40 m. net, 9.12 p.m., Mar. 25, 1944). Type in South Australian Museum, Reg. No. C. 2620.

The tiny type female has a patch of granules on the back of the carapace in the posterior half but these are absent in the other specimens. In the male the spines on the inner margin of the endopod of the uropod vary in number from seven to nine, but the setae of the peduncle of this appendage are restricted to distal half. The small series of adults exhibit a rather unusual range in size but the appendages of all are too alike to admit the probability of more than one species.

In general, *minor* rather closely resembles *unisulcata*, but apart from the much smaller size is distinguished by the markedly more distinct lateral impression on the carapace, the proportions of the joints of the third maxilliped and first and second pereopods, and the shorter uropod; further, the plumose dactylar setae of the second leg are very long whereas in *unisulcata* they are insignificant.

The pereopods are remarkably like those of *triplicata* but that species is at once separated by the three lateral carinae, while the carapace of the male is more arched, the third maxilliped is distinctive, etc.

The carapace of the female has the lateral furrow much as in that of *lutidactyla*, which has very different pereopods; it is, however, more boldly arched dorsally, as in *glabra* and *thompsoni*, but does not project backwards over the free pedigerous somites as in the two last-named species.

## CAMPYLASPIS TRIPPLICATA sp. nov.

*Adult male.* Integument calcified brittle. Carapace with an upwardly curved depression on each side, bordered above and below by a fine ridge, and not reaching to mid-line of dorsum, below this and subparallel to the lower margin of carapace is a similar third ridge; above the lateral hollow the sides are tumid, then fall into a second faint elongate depression not emphasized by ridges, and above this again is a further still fainter furrow; the dorsal margin is moderately arched, not quite evenly curved but slightly rugose, and does not form a marked angle near ocular lobe; viewed from above it is ovoid in shape, narrowest in front; it is less than one-half the length of the animal, slightly depressed and nearly twice as long as deep. Antennal notch distinct, widely open, and angle rounded and a little obtuse. Pseudorostral lobes subtruncate in front and meeting for a distance slightly greater than length of ocular lobe; respiratory tubes unusually long. Ocular lobe large, semicircular, wider than long, and with three large white corneal lenses.

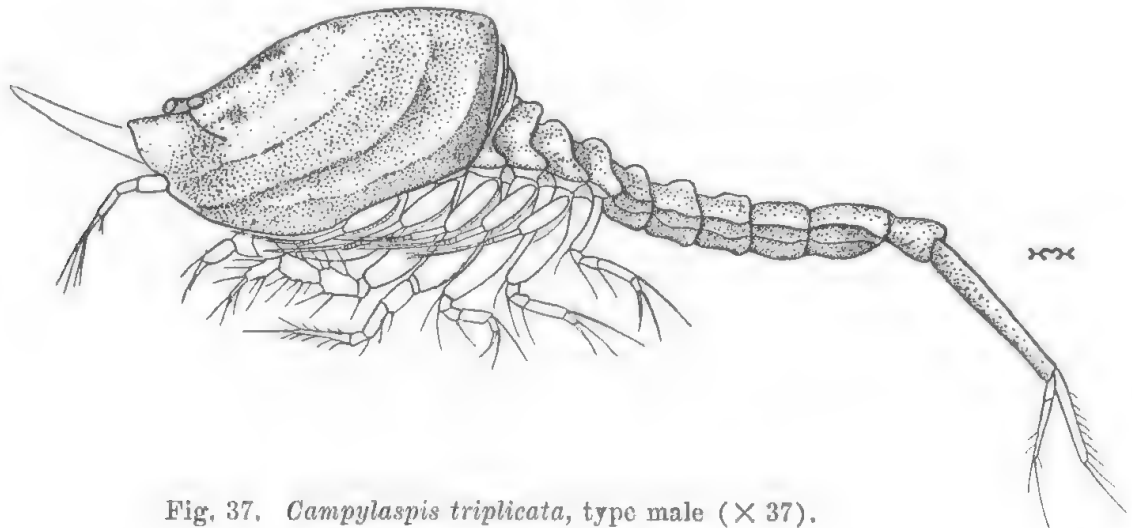


Fig. 37. *Campylaspis triplicata*, type male ( $\times 37$ ).

First pedigerous somite largely concealed; dorsal margin of first and second sloping obliquely backwards, not at all elevated; dorsum of third to fifth tumid but not markedly so; pleural parts of second to fifth only moderately expanded not much produced backwards.

Pleon somites (like pedigerous) smooth; no sulcus on fifth somite; telsonic somite widest posteriorly where it is fully as wide as long, and with apex angularly rounded.

Third maxilliped stout, with basis much shorter than rest of limb; merus rather wide (its greatest breadth a little more than half the length) longer than carpus, propodus and dactylus together, with two teeth towards distal end of outer margin; carpus much wider but a little shorter than propodus, with four curved teeth on outer edge and three less sharply defined on inner.

First pereopod with basis shorter than rest of limb; remaining joints with margins irregular but without teeth; merus, carpus and propodus subequal in length (merus longer than carpus, which is longer than propodus); dactylus relatively long, five-sixths as long as propodus.

Second pereopod about equal in length to first, with basis almost as long as remaining joints together; dactylus much longer than merus or carpus, which



are subequal in length; merus and carpus together as long as propodus and dactylus together; longest terminal seta of dactylus fully as long as the latter.

Peduncle of uropod with setae, successively increasing in length, on whole length of inner margin; it is long, nearly three times length of telsonic somite and almost twice as long as endopod, which is one-fifth as long again as exopod; there are seven "serrate" spines, successively increasing in length, on inner margin of endopod and two terminal spines, one of which is a little longer than the other

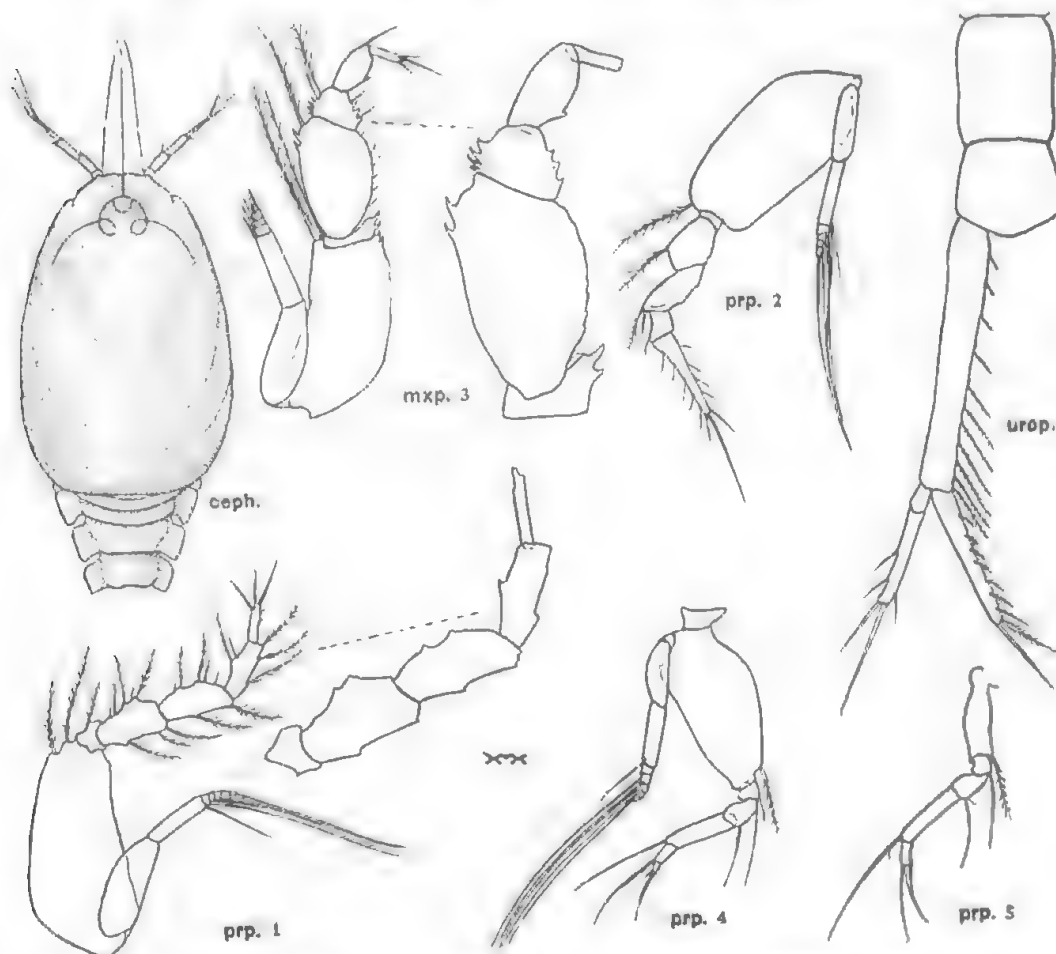


Fig. 38. *Campylaspis triplicata*, type male; ceph., cephalothorax from above ( $\times 34$ ); mxp. 3, prp. and urop., third maxilliped, peracopods and uropod with fifth pleon and telsonic somites ( $\times 54$ ; distal portions of maxilliped and first peracopod, with plumose setae omitted,  $\times 90$ ).

and more than half the length of the ramus: the marginal spines are interspersed with minute spinules; exopod with longest of two apical spines as long as itself and with two setae on outer margin and one, subdistal, on inner.

Colour, white.

Length, 2.3 mm.

Loc. Queensland: off Moreton Island (type loc., "Warreen" Station, May, 1939); Moreton Bay, Myora Bight, surface (I. S. R. Munro, Station 46, 50 cm., 40 m. net, 11.30 p.m., Nov. 29, 1940); Noosa River, below Gympie Terrace, and level with Gympie Terrace, surface (I. S. R. Munro, Stations T.44.1-2, 50 cm., 40 m. net, 9.12 p.m. and 9.28 p.m., Mar. 25, 1944). Type in South Australian Museum, Reg. No. C. 2582.

The female is unknown but the adult males range from 1.9 mm. to 2.4 mm. in length. All examples have been preserved in formalin.

The only other species of the genus possessing three ridges on each side is the Northern *costata* Sars (1900, p. 87, pl. lx), which differs in having the hindermost carina bifurcate and the third maxillipeds considerably different.

*CAMPYLASPIS ROSCIDA* sp. nov.

*Ovigerous female.* Integument thin, calcified, brittle, scarcely at all flexible. Carapace with short sparse hairs and a few pellucid spots; generally smooth, but with feeble antero-lateral tumidities and with very small glassy tubercles anteriorly and dorso-laterally, so that it appears as if sprinkled with tiny dewdrops; boldly vaulted dorsally and oval when viewed from above; with greatest width less than depth and less than two-thirds its length; it is a little less than half total length of animal. Antennal notch slight, but distinct; angle rounded.

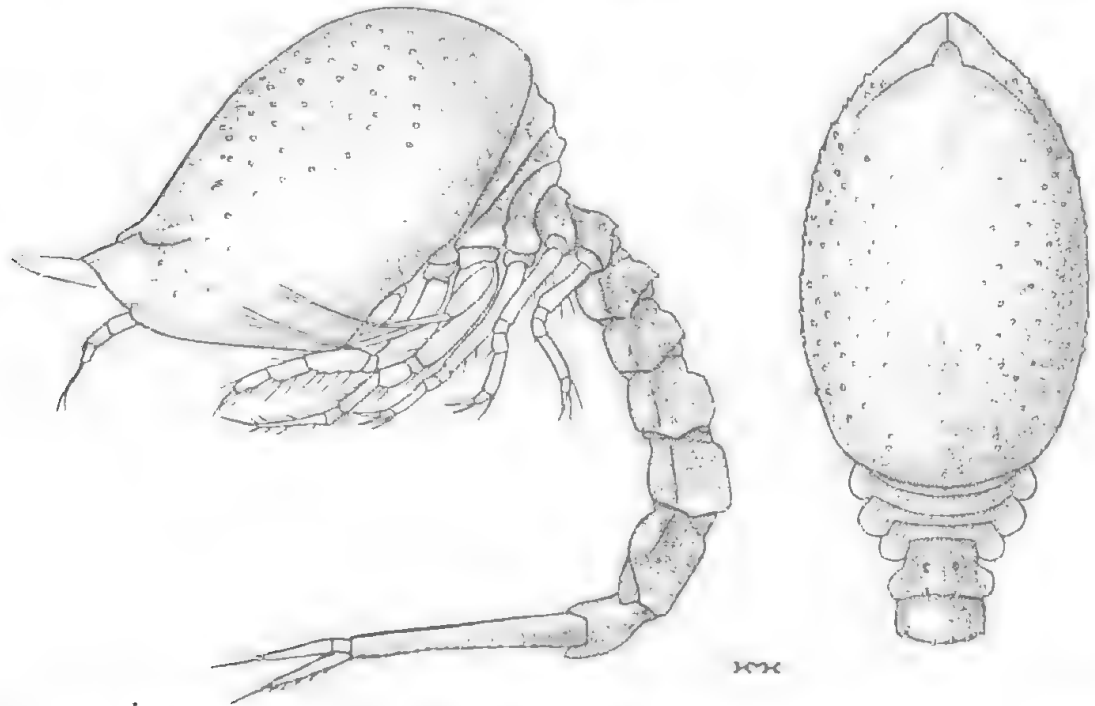


Fig. 39. *Campylaspis roscida*, lateral view and dorsal view of cephalothorax of type female ( $\times 27$ ).

Pseudorostral lobes oblique in front, meeting for a distance equal to length of ocular lobe which is not pigmented, is roundly subtriangular and not constricted at base; corneal lenses not distinct but an oval opaque area at each lateral corner and at apex.

Pedigerous somites sprinkled with obsolete granules particularly laterally, with fine median line as on carapace; first and second somites exposed, slightly and angularly elevated dorsally; pleural portions of first to third expanded and globose; fourth less expanded laterally with a pair of dorsal pits and a pair of tubercles at hinder margin; fifth not expanded laterally, with a pair of posterior dorsal tubercles and one or two dorso-lateral tubercles.

Marsupium not visible from the side.

Pleon somites with faint imbricate-tuberculate patterning; first and second with fine median dorsal line and with three small dorso-lateral tubercles (similar

to those of carapace) on each side at hinder margin; fifth not cingulate and with a pair of small tumidities anteriorly; telsonic somite short, little produced, and rounded posteriorly.

Second joint of peduncle of first antenna shorter than first and a little longer than third; first segment of flagellum not much longer than second.

Second antenna two-jointed.

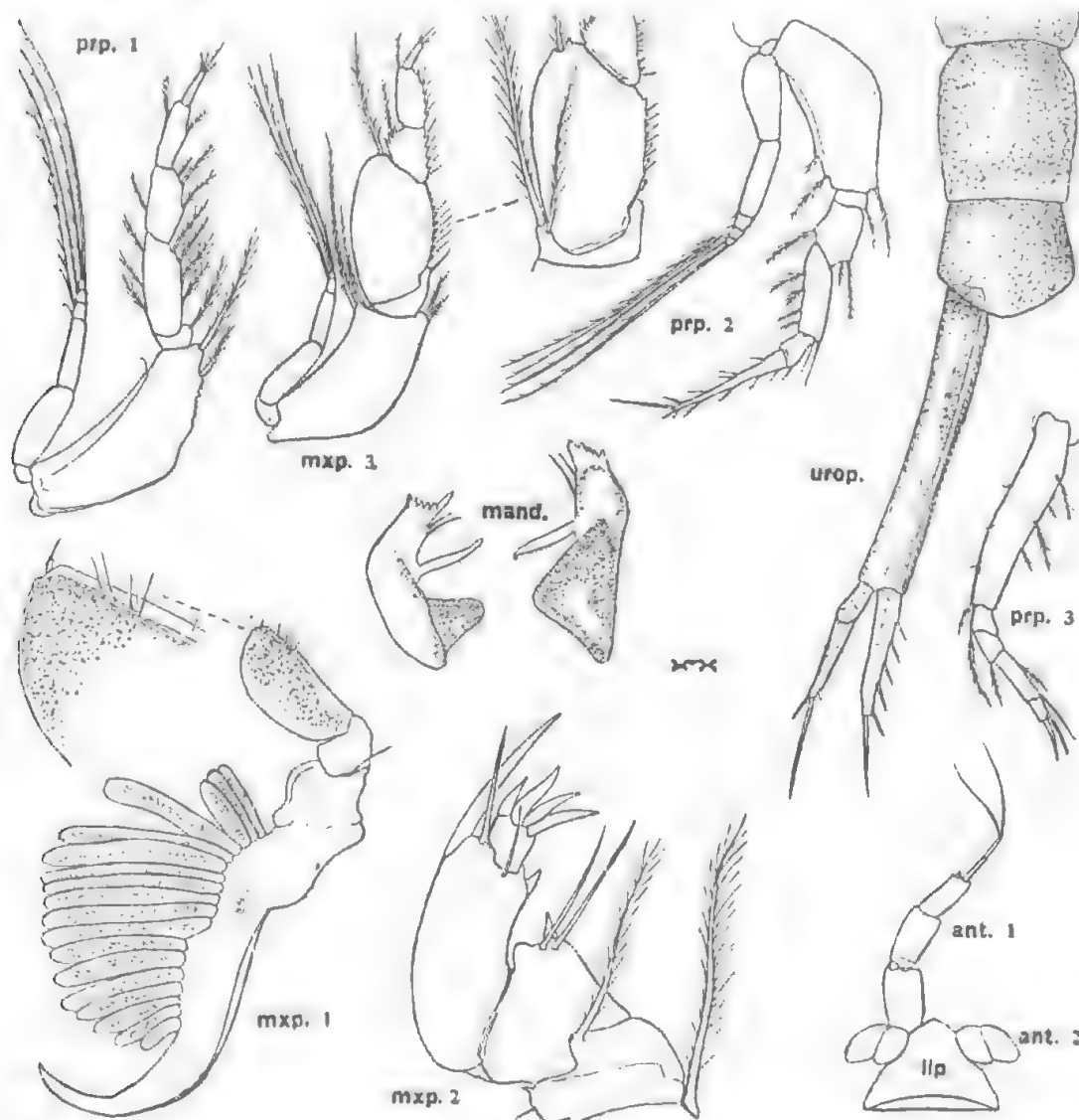


Fig. 40. *Campylaspis roseida*, paratype ovigerous female: lip, ant. and mand., upper lip, antennae and mandibles ( $\times 62$ ); mxp. and prp., maxillipeds and peraeopods ( $\times 56$ ); distal portions of first and second maxillipeds, ( $\times 144$ ); urop., uropod with fifth pleon and telsonic somites ( $\times 56$ ).

First maxilliped with terminal joint minute, elongate, capped with a single bristle; eighteen gill-lobes.

Terminal joint of second maxilliped with four stout spines, three subequal in length and one shorter; penultimate joint with outer distal spine twice the length of spines of terminal joint, with two setae and with an inner distal tooth.

Third maxilliped with basis wide and short, not much longer than ischium, merus and carpus together; merus very large, fully as long as carpus, propodus and dactylus together, less than twice as long as wide, serrate on inner margin

but with no outstanding teeth; carpus serrate on inner edge and with three small teeth on outer margin; propodus narrower but slightly longer than carpus; serrate on inner edge and twice as long as dactylus.

First pereopod with basis shorter than rest of limb; merus one-third as long again as carpus, which is longer than propodus and almost twice as long as dactylus.

Second pereopod not longer than first, with basis as long as ischium to propodus together; dactylus as long as carpus and propodus together and with one of the terminal setae long, half the length of the joint.

Peduncle of uropoda subcylindrical, serrate on inner margin, about two and one-half times as long as telsonic somite, and as exopod; endopod scarcely longer than exopod, with five serrate spines on inner edge and a terminal spine more than half its length; exopod with slightly longer terminal spine and a shorter one.

Colour, pure milk white.

Length, 4.3 mm.

*Loc.* New South Wales: 5 miles east of Port Hacking; 100 metres, on mud ("Cromulla" Trawl Station, July, 1943); 4 miles off Eden, 70 metres, in silt (type loc., K. Sheard, Oct., 1943); 4 miles east of Port Hacking, 80 metres, on mud (K. Sheard, trawled, May, 1944). Tasmania: off Babel Island, lat. 33° 55' S., long. 148° 31' E. ("Warreen" Station 29. Jan., 1939). Type female in South Australian Museum, Reg. No. C. 2526.

As in some other species the ventral incubatory pouch of the ovigerous female is not bulging and prominent. In a female slightly smaller than the type (4.2 mm.) eleven embryos, each 0.4 mm. in greatest length, occupy almost all of the interior of the thorax.

The tubercles of the carapace are so small that they are perhaps better described as granules. Subadult examples sometimes have these more numerous but still smaller, and less conspicuous owing to a closer covering of short hairs.

This species is somewhat close to *thompsoni*; the most apparent differences in the adult female are the shorter peduncle of the uropod and the narrower carapace with its small tubercles; the joints of the first and second pereopods are of different proportions. *C. laticarpa* Hansen (1920, p. 40, pl. iii, fig. 3) has similar sculpture of the carapace but the maxillipeds are very different.

#### CAMPYLASPIE ECHINATA sp. nov.

*Adult male.* Integument thin, but tough and somewhat flexible; pleon more highly calcified and more brittle than thorax; rather coarsely reticulate on carapace.

Carapace with numerous small blunt-ended spiniform projections densely placed on back and sides, sparser infero-laterally; at hinder margin the spines are longer and a pair of dorsal ones are particularly outstanding; interspersed is a sparse clothing of fine hairs; an elongate shallow depression on each side; an antero-lateral tumidity on each side, studded with spinules smaller than rest of armature; it is somewhat rectangular as seen from above, is depressed, twice as long as deep, and is barely as long as the pleon. Antennal notch distinct, rather narrowly excavate for the genus; angle rounded, margined with spines. Pseudo-rostral lobes widely truncate in front, meeting for a distance less than length of ocular lobe which is narrow, dilated anteriorly and is nearly twice as long as wide; no corneal lenses apparent.

None of pedigerous somites elevated dorsally but second to fifth each with a pair of outstanding spines on back, those of fifth nearly as deep as the somite; other spines are placed on sides and back of these somites while on the flattened-globose expanded pleural parts of each is a fan of four or five outstanding spines.

Pleon somites one to five with long and short spines on back and with upper edge of antennal furrow spinose; a few shorter spines infero-laterally; fifth somite without trace of transverse sulcus; telsonic somite rather narrow, distally rounded and moderately produced.

Second peduncular joint of first antenna shorter than first, longer than third and about as long as the flagellum, the two segments of which are subequal in length.

Last joint of peduncle of second antenna half as long again as penultimate.

First maxilliped with terminal joint more robust than usual in the genus, more than one-fourth as long as penultimate segment, not much more than twice as long as wide, slightly constricted near apex, which bears two minute setae, and with a row of tiny setae on outer distal edge; penultimate joint with some unequal short setae (see fig. 42) and two stout plumose setae; twenty-two gill lobes.

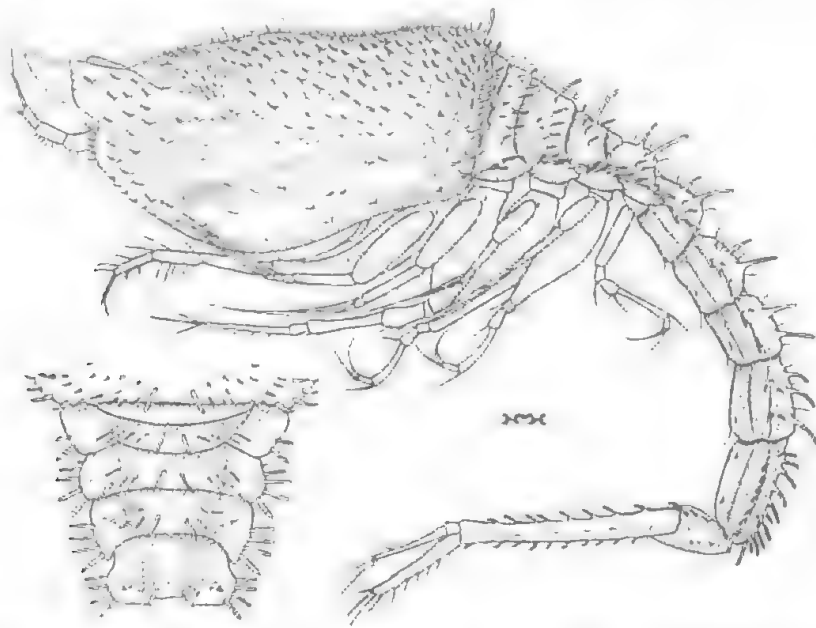


Fig. 41. *Campylaspis echinata*, lateral view and dorsal view of pedigerous somites ( $\times 20$ ).

Distal joint of second maxilliped with a short seta and two stout unequal spines, the longer not reaching to the level of the tip of the outer spines of the penultimate joint.

Third maxilliped with basis stout, longer than rest of limb, with serrations and distal tooth on inner edge; ischium with two inner blunt teeth; merus narrow, with small teeth in both margins and a large outstanding subdistal outer tooth, almost as long as the joint is wide; not including the teeth the merus is three times as long as wide and is not nearly as long as carpus and propodus together; carpus with denticles on inner edge and three separated outer teeth the middle one of which is long; propodus elongate, nearly half as long again as carpus, and unarmed.

First peracopod with basis stout, longer than rest of limb, which is slender; merus serrate on both margins and with a larger outer tooth near distal end; carpus serrate on both edges, barely more than three-fourths length of merus and distinctly longer than the propodus, which is less than twice as long as dactylus.

Second peracopod not longer than first, its stout basis longer than ischium to propodus together; dactylus longer than carpus, almost as long as carpus and propodus together and with longest terminal seta two-thirds its own length.

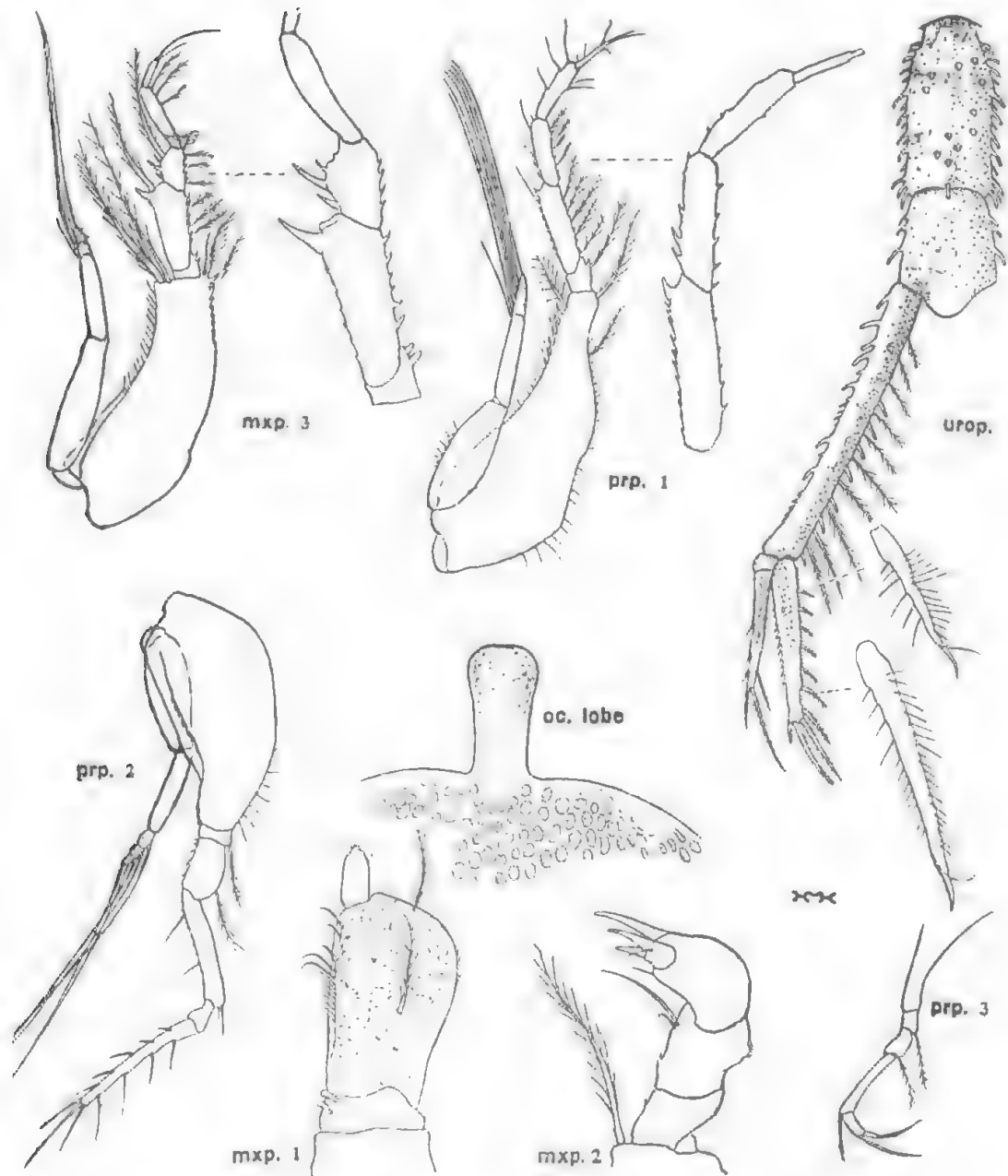


Fig. 42. *Campylaspis echinata*, type male; mxp. 1-2, distal portions of first and second maxillipeds ( $\times 76$ ); mxp. 3 and prp., third maxilliped and peracopods ( $\times 34$ ; distal portions with plumose setae omitted,  $\times 64$ ); urop., uropod with fifth pleon and telsonic somites ( $\times 34$ ; spines of endopod,  $\times 300$ ).

Third to fifth peraeopods with carpus very slender and dactylus long.

Peduncle of uropod with long and shorter spiniform projections, more than twice as long as telson and less than twice as long as endopod; exopod distinctly shorter than endopod (four-fifths as long as it) with a spine on inner edge and two similar unequal terminal spines; endopod serrate on outer edge, with seven spines on inner margin and three terminal spines, one short, the others long and subequal in length.

Colour, yellow.

Length, 5.3 mm.

Loc. New South Wales: 4 miles off Eden, 70 metres, in silt (K. Sheard, submarine light, Oct., 1943). Type in South Australian Museum, Reg. No. C. 2534.

Details of the "spines" (composite setae) of the rami of the uropods are shown in fig. 42. Similar spines occur on the uropods of several other Australian species.

This form is readily recognized by the distinctive armature and the linguiform ocular lobe, dilated anteriorly as in *macrophthalmia* Sars.

*CAMPYLASPIS PUSTULOSA* sp. nov.

*Adult male.* Integument calcified brittle, with coarse reticulate patterning on carapace.

Carapace with well spaced rounded, subconical tubercles, the antero-lateral ones prominent, and with a shallow very elongate depression on each side not margined by carinae or emphasized by disposition of tubercles; from above and also from the side it is roughly sub-rectangular in shape, wider than depth (which is half its length) and it is only as long as pleon. Antennal notch widely open and angle as seen from side rounded. Pseudorostral lobes widely truncate and finely denticulate in front, meeting for a distance less than length of ocular lobe. The last-named is dilated, not much longer than wide and is constricted at base; there is a lens at each side and a pair of much smaller ones at apex, which is incised.

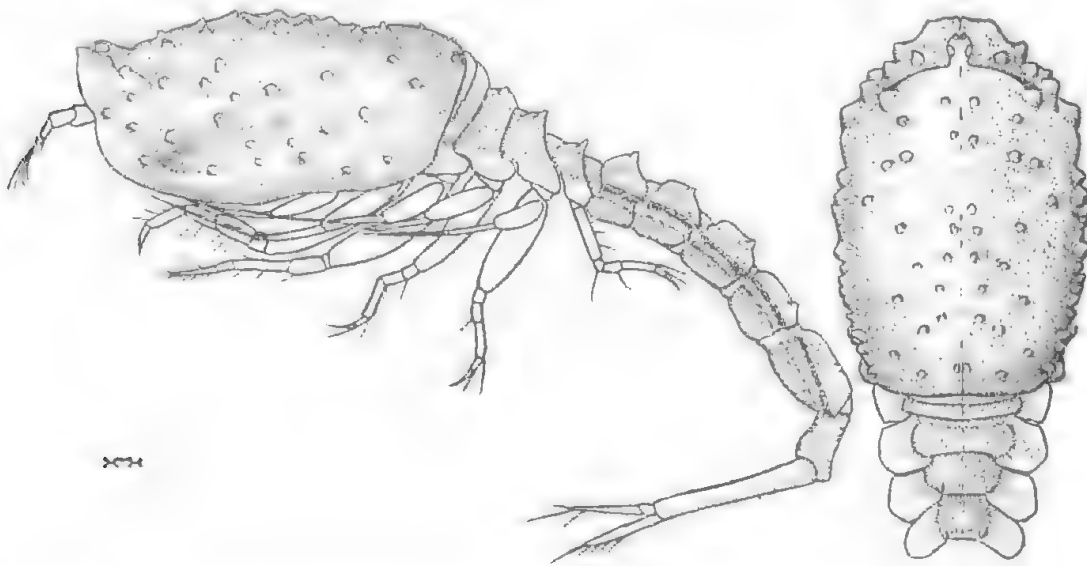


Fig. 43. *Campylaspis pustulosa*, lateral view and dorsal view of cephalothorax of type male ( $\times 20$ ).

First and second pedigerous somites rounded dorsally not at all produced; third slightly elevated dorsally and fourth and fifth each with a pair of angular dorsal tubercles each seated on a tumidity; pleural parts of second to fifth expanded and somewhat angularly rounded, with reticulate pattern as on carapace.

Pleon somites each with a pair of dorsal tubercles, which are angular when viewed from the side; on the fifth they are situated on a faint transverse sulcus, and on the telsonic somite at the proximal third; the upper margins of the antennal groove are serrate; telsonic somite moderately produced and rounded distally.

Second peduncular joint of first antenna longer than first and much longer than third, which equals the two-jointed flagellum in length.

Terminal joint of peduncle of second antenna more than twice as long as penultimate.

First maxilliped with terminal joint relatively large, fusiform, almost one-fourth as long as penultimate joint and capped with two setae, one short and one minute; epipod with about a score of gill-lobes.

Distal joint of second maxilliped with a spine and a slightly shorter strong seta; penultimate joint with a slender outer spine not nearly reaching the tip of distal spine and with an inner tooth and seta.

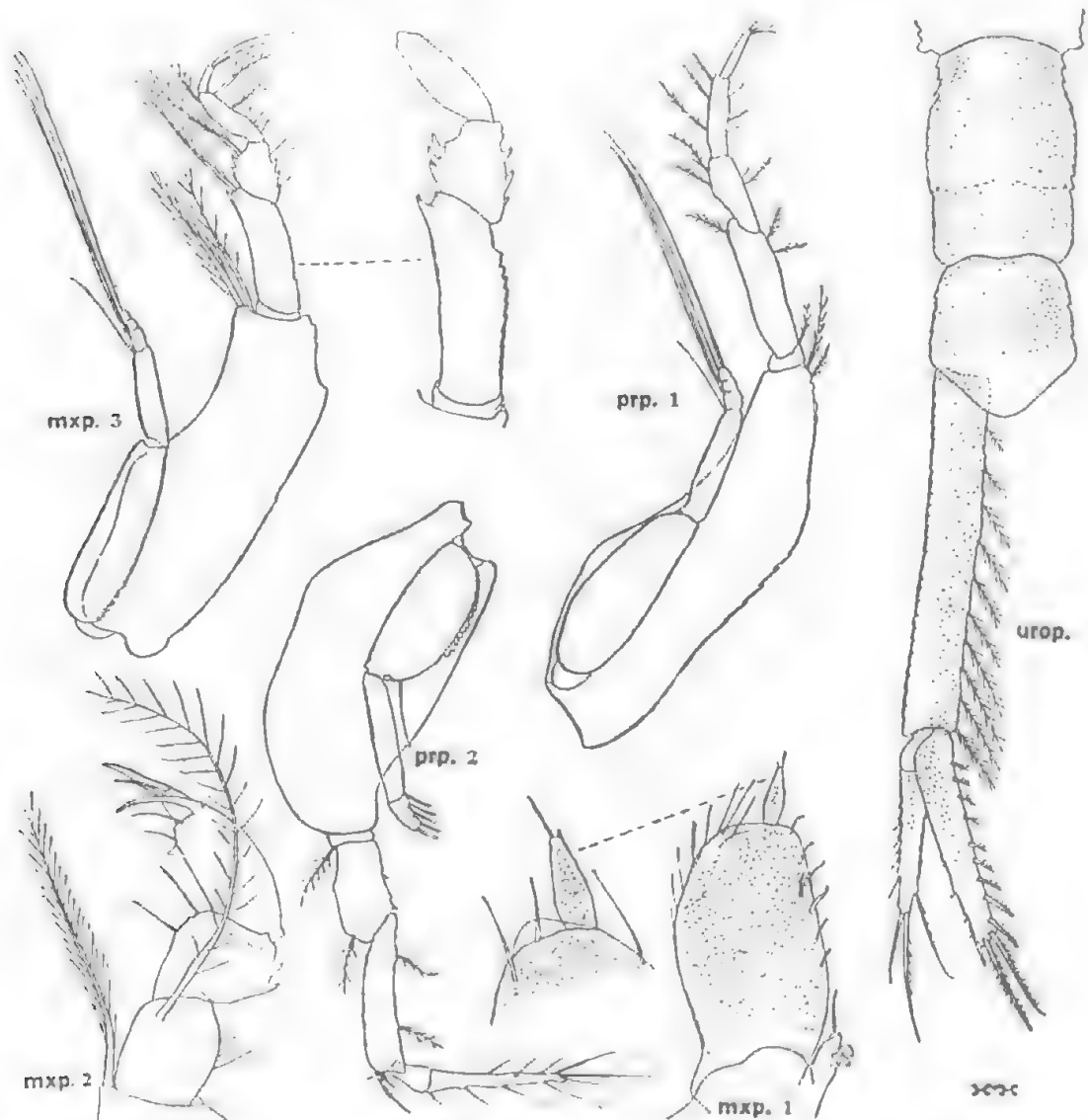


Fig. 44. *Campylaspis pustulosa*, type male; mxp. 1-2, distal portions of first and second maxillipeds ( $\times 142$ ; terminal joint of first,  $\times 285$ ); mxp. 3, prp. and urop., third maxilliped, peraeopods, and uropod with fifth pleon and telsonic somites ( $\times 50$ ; joints of maxilliped with plumose setae omitted,  $\times 76$ ).

Third maxilliped with basis wide, much longer than rest of limb; ischium very short, collar-like; merus narrow, almost as long as carpus and propodus together three times as long as wide, with a subdistal outer tooth and with inner margin serrate; carpus wider and shorter than propodus, with three teeth on each margin, those on outer edge crowded.

First peraeopod with basis wide, serrate on inner edge and longer than rest of limb, which is not dentate; merus more than one and two-thirds times as long



as carpus which is as long as propodus; dactylus distinctly more than half as long as propodus.

Second peracopod as long as first, with basis wide but somewhat shorter than rest of limb; dactylus shorter than carpus, with its longest terminal seta two-thirds its length.

Peduncle of uropod with crenulate margins and inner plumose setae not very long; it is two and one-fourth times as long as the telsonic somite and twice as long as exopod; endopod one-fifth as long again as exopod with nine compound spines on inner margin and three terminal spines, one short the others long and subequal in length: the longest of the two unequal terminal spines of the exopod is as long as the second joint of that ramus.

Colour, white.

Length, 4.8 mm.

*Loc.* New South Wales: 4 miles east of Eden, 70 metres, in silt (K. Sheard submarine light, Oct., 1943). Type in South Australian Museum, Reg. No. C. 2518.

The spines of the rami of the uropoda are of the same type as those figured for *echinata* but the lateral projections are shorter. The maxillipeds are somewhat as in *echinata* but otherwise the two species exhibit many obvious differences.

#### CAMPYLASPIS ASPERA sp. nov.

*Oviparous female.* Integument calcified, brittle, with coarse honeycomb-like pattern, particularly distinct on carapace.

Carapace studded with conical tubercles and with an elongate depression on each side, not margined by carinae or definitely outlined by rows of tubercles: the antero-lateral elevation is moderately emphasized, the dorsal contour is well arched and forms a decided angle at the base of the ocular lobe; viewed from above the carapace is ovoid in shape, broader than deep, its greatest width three-fourths of its length; it is one-half the total length of the animal. Antennal notch widely open; angle, and inferior margin behind it, finely dentate. Pseudorostral lobes concave in front and meeting for a distance less than the length of the ocular lobe, which is a little longer than wide, has a minute incision at apex, and bears three corneal lenses (the anterior one divided) in the front half.

Pedigerous somites not at all elevated; like the carapace each is marked with a fine, wavy median line, pleural parts of second to fifth expanded and, seen from above, subacute laterally: there is a pair of dorsal tubercles on each of the third to fifth somites.

Marsupium bulging and prominent; ova 0.28 mm. in diameter.

Pleon somites one to five each with a pair of small dorsal tubercles at hind margin and with a low oblique dorso-lateral ridge, which terminates posteriorly in a little projection; fifth somite with well-marked transverse sulcus; telsonic somite widened posteriorly, apex rather angular but not much produced.

Second peduncular joint of first antenna distinctly longer than third and as long as the flagellum, the two joints of which are subequal in length.

First maxilliped with terminal joint elongate, nearly one-fifth as long as penultimate segment and capped with a single seta; marginal setae of penultimate joint stout; ten gill lobes plus one reflexed.

Distal joint of second maxilliped with two spines, one twice as long as the other; penultimate joint with a somewhat bent outer spine (which reaches level of tip of the shorter distal spine) and with an outer tooth and slender seta.

Third maxilliped elongate, with basis fully as long as rest of limb; merus twice as long as wide, rather longer than carpus and propodus together, and with a prominent subdistal tooth (as well as a couple of smaller teeth) on outer margin, and

with a few small teeth on inner; carpus wider and barely longer than propodus, with three outer teeth and two denticles on inner margin; dactylus half as long as propodus.

First peraeopod with basis serrate on inner margin near distal end, and fully as long as remainder of limb; ischium with an inner tooth; merus with an outer subdistal tooth, nearly half as long again as carpus, which is subequal in length to propodus and twice as long as dactylus.

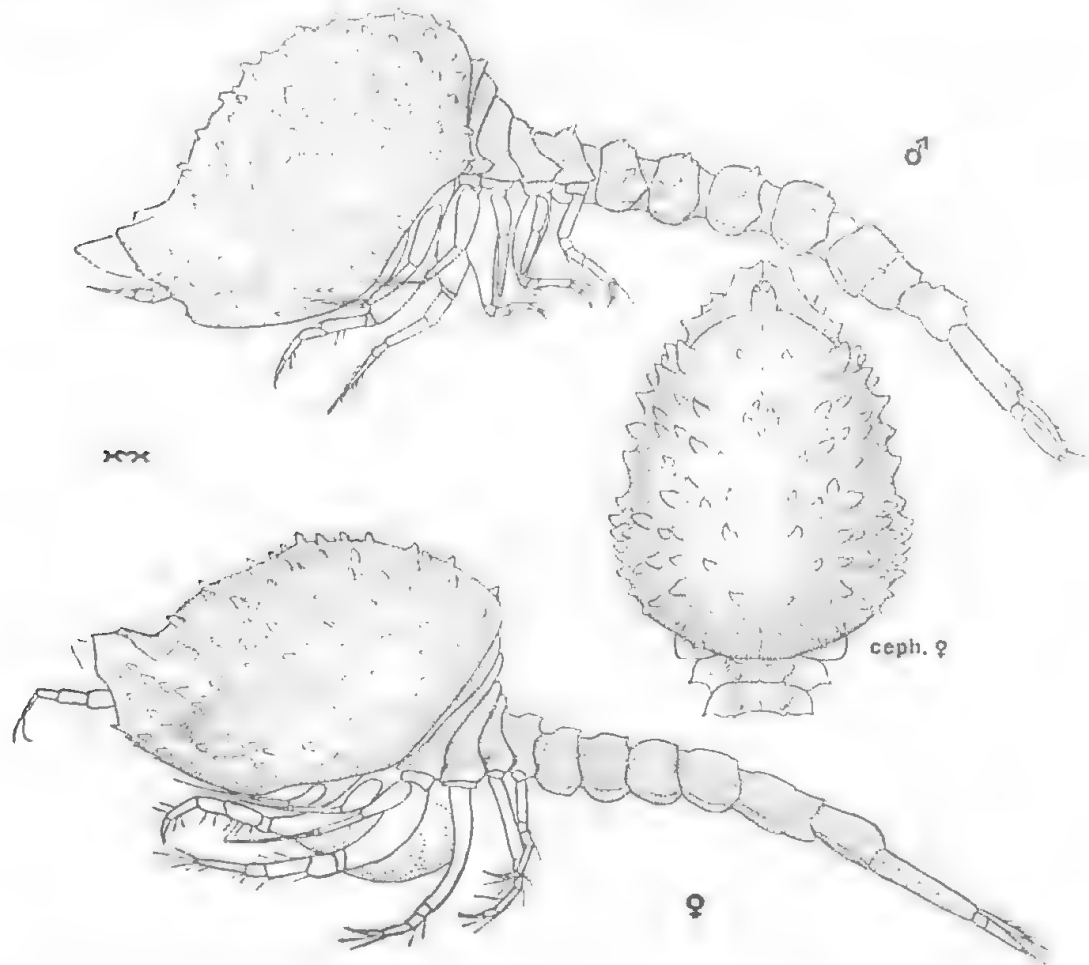


Fig. 45. *Cumppylaspis aspera*; lateral views of type ovigerous female and paratype subadult male, and cephalothorax of type female from above ( $\times 22$ ).

Second peraeopod longer than first, with the stout basis as long as ischium to propodus together; dactylus a little shorter than carpus and equal in length to its longest terminal seta.

Peduncle of uropod ridged above and serrate on both margins, nearly one and two-thirds times as long as telsonic somite and as endopod, which is a little longer than exopod; four spines, successively increasing in length, and interspersed with a few tiny spines, on inner edge of endopod and two very unequal ones at apex; exopod with two unequal terminal spines, the longer equal in length to that of the other ramus.

Colour, yellow, patterned on pleon with purplish brown.

Length, 3-9 mm.

*Subadult male.* This is figured because, like some adult females, it has the tubercles of the carapace rather more distinctly arranged in rows. The honeycomb-like sculpture is very distinct and some of the tubercles above the lateral depression are larger than the others. The small tubercles on the pleon are rather more distinct than in the female and the fifth somite is strongly cingulate; the dorso-lateral ridges are feebly serrate.

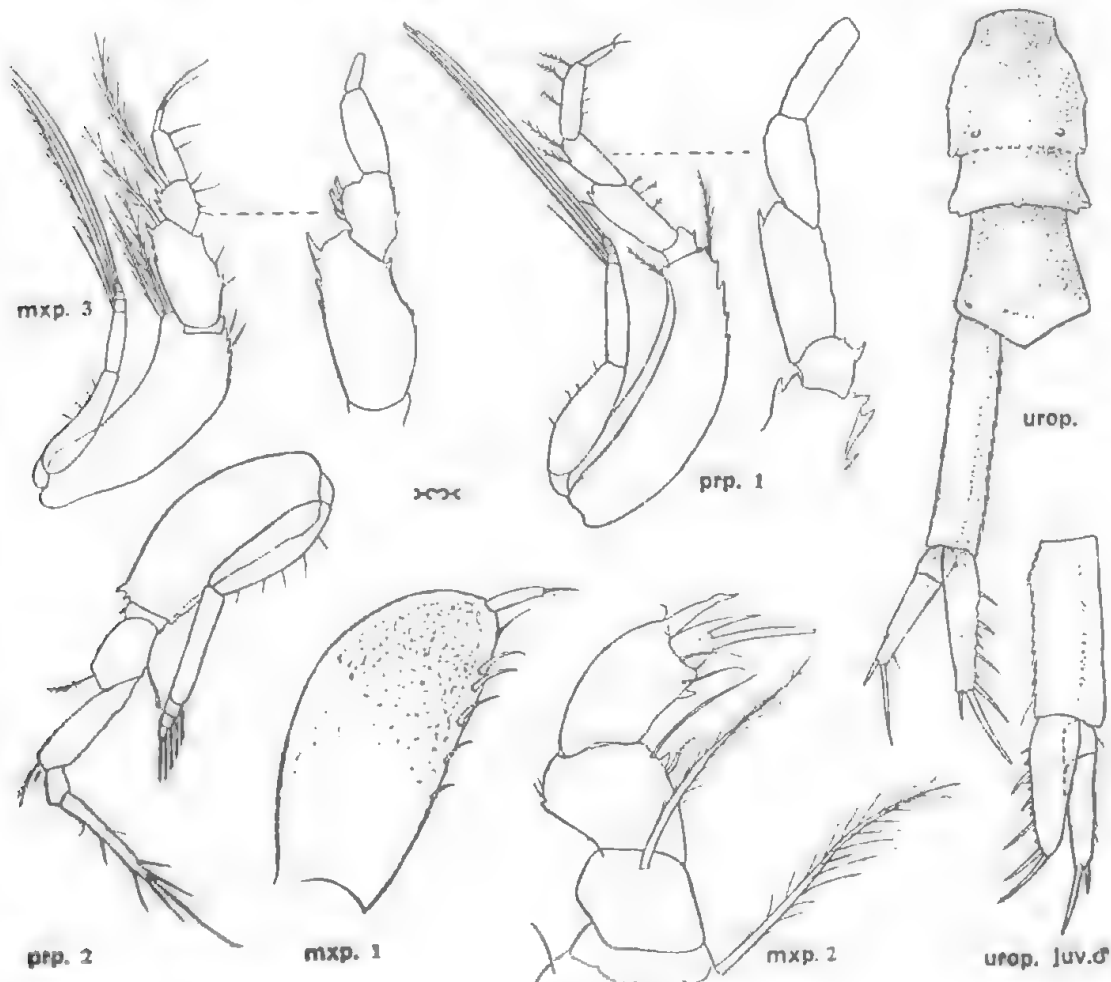


Fig. 46. *Campylaspis aspera*, paratype female; mxp. 1-2, distal portions of first and second maxillipeds ( $\times 144$ ); mxp. 3, prp. and urop., third maxilliped, pereopods, and uropod with fifth pleon and telsonic somites ( $\times 50$ ; distal portions with plumose setae omitted,  $\times 75$ ). urop., juv., uropod of young male ( $\times 50$ ).

The carapace is narrower than in the female; the ocular lobe is wider, is slightly constricted at the base, and slightly incised at apex.

There is a pair of dorsal tubercles on the telsonic somite and a broken median carina.

The maxillipeds are as illustrated for the female.

The uropod (fig. 46, urop. juv.) has the peduncle shorter and wider than in the adult.

Although this male is as large as the ovigerous females, the abdominal antennal groove has not yet developed (the second antennae are still short).

*Loc.* New South Wales: 5 miles east of Port Hacking, 100 metres, on mud ("Cronulla" Trawl Station, July, 1943); 4 miles east of Eden, 70 metres, in

silt (type loc., K. Sheard, trawled Oct., 1943); 4 miles east of Port Haeking, 80 metres, on mud (K. Sheard, trawled May, 1944). Type female in South Australian Museum, Reg. No. C. 2517.

*C. aspera* is close to *antarctica* Calman (1907, p. 5, pl. i, fig. 14-16 and text fig. 4; and 1915, p. 155, fig. 9). In the last-named, however, the merus of the third maxilliped is much smaller, being considerably less than length of carpus and propodus combined. It likewise resembles the Northern *verrucosa* Sars (see Hansen, 1920, p. 45, pl. iii, fig. 8a) but differs in the strongly developed transverse sulcus of the fifth pleon somite, the shorter peduncle of the uropod and in having the tubercles of the carapace less flattened.

#### CAMPYLASPIS THETIDIS sp. nov.

*Female.* Integument strongly calcified.

Carapace studded with rounded tubercles, which tend to fall into rows; sides with two parallel longitudinal ridges, bounding a large subquadrate, depressed area at top and bottom; the upper carina is strongly tuberculate and extends from above the antennal notch to beyond second third of carapace, the lower ridge is less markedly tuberculate; above the upper carina there is a longitudinal dorso-lateral tuberculate elevation and towards the front is the usual antero-lateral prominence emphasized in sculptured species, in this case a tubercle larger than the

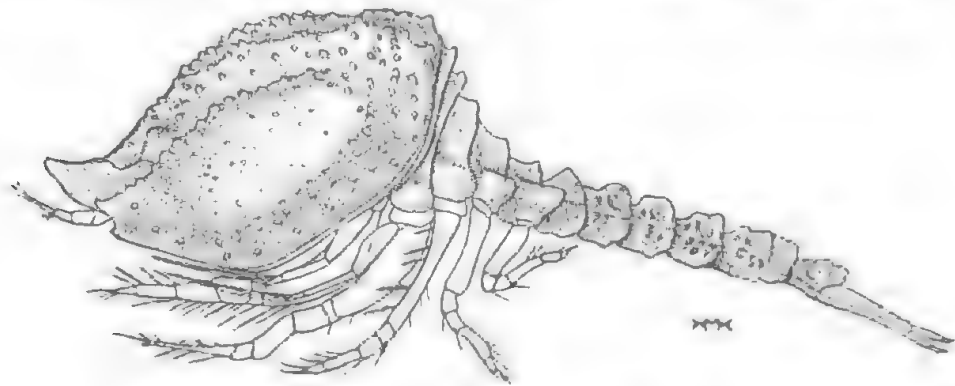


Fig. 47. *Campylaspis thetidis*, type female ( $\times 14$ ).

others. The back of the carapace is marked with a very fine median line anteriorly but is longitudinally sulcate for the greater part of its length, the furrow expanded posteriorly over the cardiac region where there is a short median longitudinal carina, which is one-sixth of the length of carapace. Viewed from above the carapace is subquadrate, about as wide as deep and not quite two-thirds as wide as long; it is as long as pedigerous and first to fifth pleon somites. Pseudorostral lobes narrowing to the front, very oblique in lateral view, and meeting for a distance equal to three times length of ocular lobe, which is small, longer than wide, and with no apparent corneal lenses. Antennal notch wide but distinct angle with small denticles, subacute.

Pedigerous somites each with a pair of low dorsal tubercles near hinder margin; first and second dorsally very short but slightly elevated; pleural parts of second to fifth expanded and inflated, in second rounded laterally, in last three angular and slightly produced backwards.

First two somites of pleon with transverse dorsal carina, from which branch off a pair of short longitudinal ridges, which are faint on the first; third to fifth somites each with median carina (rugose owing to prostrate serrations) and a similar transverse ridge crossing it near posterior end; fifth with a second collar-

like transverse ridge, posterior to which is a sulcus dividing the somite into two parts; dorso-lateral edges ridged and below them, on anterior portions of first to fifth there is a short lateral carina; the spaces between carinae have an eroded appearance; posterior half of telsonic somite triangular as seen from above, and (for the genus) well produced.

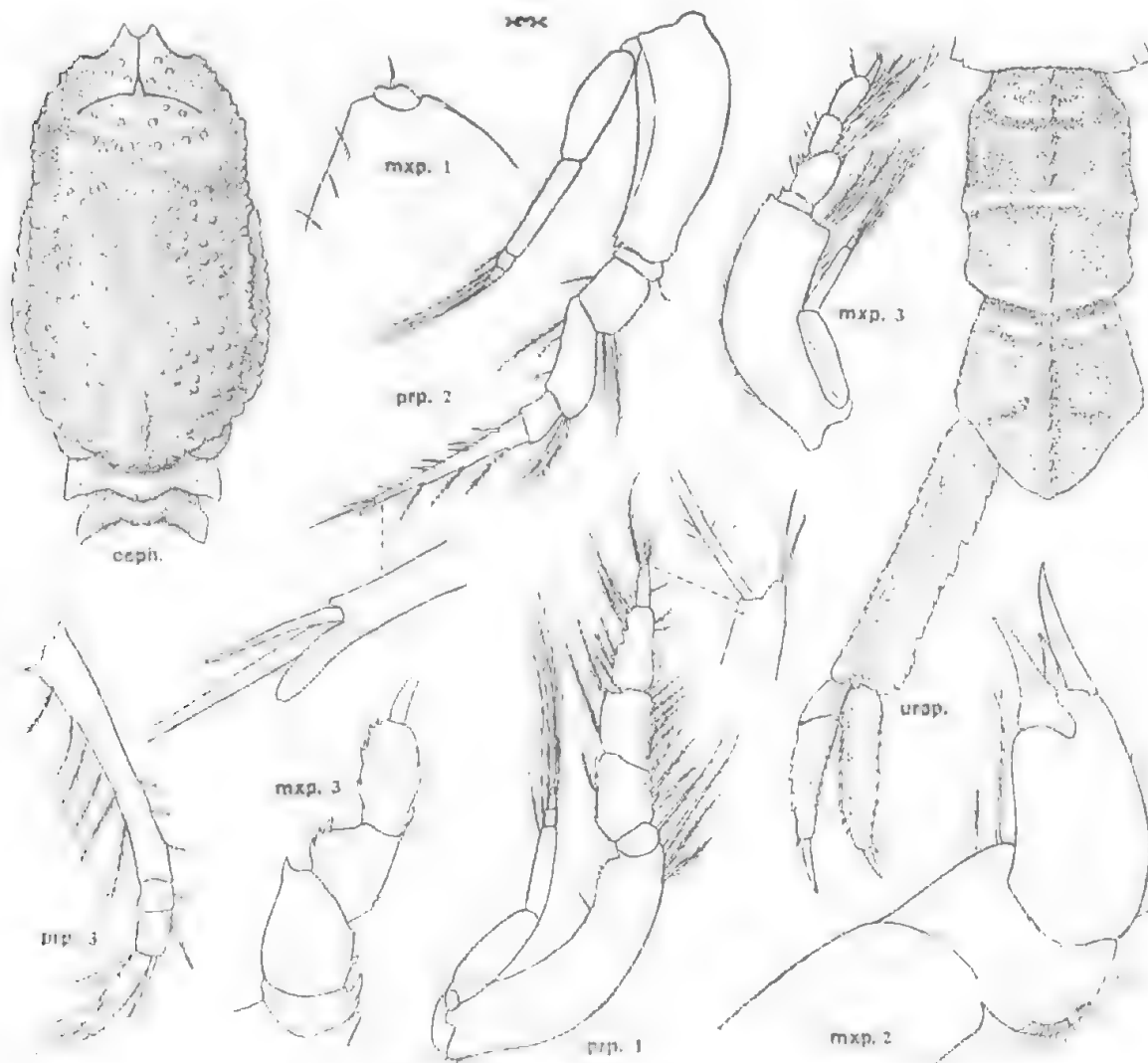


Fig. 48. *Campylaspis thetidis*, type female; ceph., cephalothorax from above ( $\times 14$ ); mxp. 1-2, distal portions of first and second maxillipeds ( $\times 125$ ); mxp. 3, and prp., third maxilliped and peraeopods ( $\times 23$ ; palp of maxilliped with setae omitted,  $\times 56$ ; distal end of dactylus of first and second peraeopods,  $\times 125$ ); urop., uropod with fifth pleon and telsonic somites ( $\times 43$ ).

First maxilliped with last joint minute, wider than long, and with a single seta.

Terminal joint of second maxilliped with two unequal stout spines, the longest not reaching tip of the stout outer distal spine of penultimate segment.

Third maxilliped robust; basis considerably longer than rest of limb; ischium with inner tooth; merus not much enlarged, less than half as long again as width, barely longer than propodus, with one or two small dentations on inner edge and an outer distal tooth; carpus wide, with three small outer teeth of equal size; propodus stout, with edges serrate, more than twice as long as dactylus.

First peraeopod with basis barely as long as rest of limb; merus, carpus and propodus wide, subequal in length; dactylus half as long as propodus with one of the three distal setae longer than itself.

Second peraeopod longer than first, with the stout basis much shorter than rest of limb, but longer than ischium to propodus together; dactylus as long as merus and carpus together, with a curious distal lobe, alongside which are inserted the two terminal setae, the longer of which is half as long as the joint.

Peduncle of uropod triangular in section, the apex of the median ridge and both edges jaggedly serrate; it is half as long again as telsonic somite and three-fourths as long again as the subequal rami; endopod serrate on both edges, with a toothed dorsal ridge and with two stout terminal spines, one very short; exopod with serrate edges, its apex with a stout spine, which is longer than that of endopod, and a tiny spine.

Colour, yellow.

Length, 6.6 mm.

*Loc.* New South Wales: off Cape Three Points, 41-50 fath., on sticky mud and shell ("Phetis" Station 13, Feb. 1898). Type in Australian Museum, Reg. No. G. 2225.

Although he makes no special comment regarding it, Calman's figure of the second peraeopod of *rostrata* (1905a, pl. ii, fig. 37) shows that in that species also the distal seta of the dactylus, though much shorter, is subterminal, the end of the joint projecting beyond its insertion; further, the joints of this appendage are of the same proportions as in *thetidis* which, however, exhibits obvious differences in body sculpture and has a shorter pseudorostrum.

Hansen (1920, p. 42, pl. iii, fig. 5) illustrates the second and third maxillipeds of *rostrata*; the second pair are much as in *thetidis* but in the third the merus is narrower and the carpus relatively smaller.

#### Genus PROCAMPYLASPIS Bonnier.

*Procampylaspis* Bonnier, 1896, p. 541; Stebbing, 1913, p. 184 (syn. and key); Hansen, 1920, p. 33.

This stable, widely distributed genus, is much more sparsely represented by species than is *Campylaspis*. It is well-defined, particularly in the character of the rake-like dactylus of the second maxilliped and the strikingly long ischium of the first peraeopod. Six species have been described previously and the first Australian form is recorded below.

#### KEY TO SPECIES OF PROCAMPYLASPIS.

- |   |                              |
|---|------------------------------|
| 1. Distal prolongation of dactylus of second maxilliped long and slender, nearly three times as long as rest of joint .. .. .               | <i>macrognathus</i> Hansen.  |
| Distal prolongation of dactylus of second maxilliped at most not much longer than rest of joint .. .. .                                     | .. .. . 2.                   |
| 2. Carapace with numerous dorsal tubercles in male, none in female .. .. .  | <i>bonnieri</i> Calman.      |
| Carapace with one or two dorsal tubercles .. .. .   | .. .. . 3.                   |
| 3. Carapace with one median dorsal tubercle .. .. .   | .. .. . 4.                   |
| Carapace with two dorsal tubercles .. .. .  | .. .. . 6.                   |
| 4. Dactylus of second maxilliped with three teeth on inner margin .. .. .   | <i>tridentata</i> Stebbing.  |
| Dactylus of second maxilliped with four teeth on inner margin .. .. .   | .. .. . 5.                   |
| 5. Dactylus of second peraeopod fully as long as (male), or longer than (female), carpus and propodus combined .. .. .                      | <i>armata</i> Bonnier.       |
| Dactylus of second peraeopod only as long as carpus .. .. .   | <i>sordida</i> sp. nov.      |
| 6. Ocular lobe tuberculiform and with a pair of denticles. Dorsal tubercles of carapace placed one behind the other, each bidentate .. .. . | <i>compressa</i> Zimmer.     |
| Ocular lobe narrow, not tuberculiform. Dorsal tubercles of carapace placed one on each side, and each with one small spine .. .. .          | <i>bituberculata</i> Hansen. |

## PROCAMPYLASPIS SORDIDA sp. nov.

*Ovigerous female.* Integument well calcified; form as in genotype.

Carapace about two-fifths of total length, with shagreen-like surface owing to numerous very small rough tubercles or spines; seen from the side it is prominently arched above, forms a decided angle posterior to ocular lobe and is markedly tumid at posterior end, there is a single prominent median, conical tubercle just behind middle of length. Antennal notch widely open and angle very obtuse. Ocular lobe narrow; no corneal lenses; pseudorostral sutures ankylosed; lobes reaching a little beyond eye-lobe.

First pedigerous somite with a closely applied lamella, the bifid apex of which just overlaps posterior margin of carapace medianly; second somite not at all elevated and without projections or lamella.

Pleon somites a little irregular but unarmed, successively increasing in length to fifth; telsonic somite widest in posterior half (as wide as long) somewhat angularly rounded, little produced posteriorly and about four-fifths as long as fifth pleon somite; the latter is slightly but distinctly widened in posterior third, where it is one-fourth as wide again as breadth at posterior margin.

First maxilliped with terminal joint rather wide, one-third as long as penultimate, with a single apical seta and with two dentiform projections on outer edge (see figure for other details).

In the dactylus of the second maxilliped immediately posterior to the large falcate apical tooth there is a stout but very short spine, at the base of which is a seta of about the same length; this is followed by three large inner teeth, subequal in length to the apical tooth of the joint and of about the same diameter; the most anterior of these has a faint suture near the base and the next has an insignificant accessory proximal tooth; the posterior spine is equal in length to the falcate end of the dactylus and is a little longer than the other inner spines.

Third maxillipeds with basis almost as long as rest of limb; ischium short, with an inner tooth; merus widest distally, where it is barely half as broad as its length, and bears a slender outstanding spine on outer margin; there is no other armature on the joint; carpus less than half as long as merus, with a spine on outer margin and another on the inner; propodus without armature, more than half as long as merus, and half as long again as dactylus.

First pereopod unarmed, with basis not much more than two-thirds as long as rest of limb (as long as ischium, merus and carpus together); ischium subequal in length to propodus and longer than carpus which slightly exceeds the merus in length; dactylus half as long as propodus.

Second pereopod with basis stout, somewhat longer than ischium to propodus together; merus distinctly more than half as long as carpus; dactylus subequal in length to carpus and about four times as long as propodus.

Peduncle of uropod two and one-fifth times as long as telsonic somite; endopod equal in length to last-named and a little longer than exopod, with two spines on inner margin and two very unequal terminal spines.

Colour (when cleaned) dull yellow, without any markings.

Length, 4.5 mm.

*Adult male.* Carapace nearly one-third of total length; surface with small clear-cut reticulation; posteriorly and near lower edge is a row of denticles; on the back the median conical tubercle is not quite as high as in female and there is a pair of spines near the hinder margin. Antennal notch widely open and antennal angle more prominent and less obtuse than in female.

First pedigerous somite without lamina; second to fifth somites each with a pair of dorsal spines, and with one or two spines on expanded pleural portions.

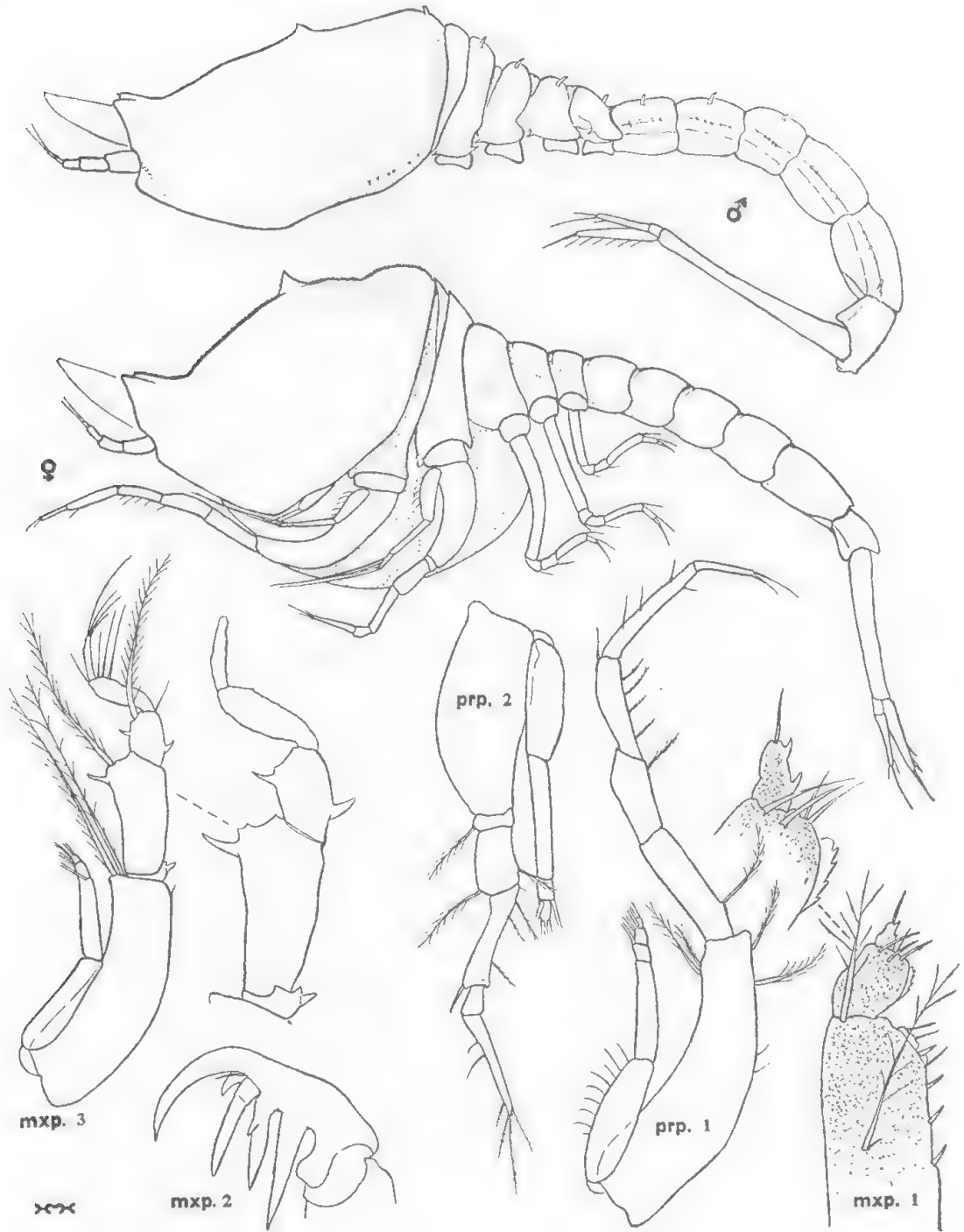


Fig. 49. *Procampylaspis sordida*. Type female and male from the side ( $\times 22$ ). Paratype ovigerous female; mxp. 1-2, distal portions of first and second maxillipeds ( $\times 144$ ; terminal joint of first,  $\times 324$ ); mxp. 3 and prp., third maxilliped and peraeopods ( $\times 50$ ; distal joints of maxilliped, with plumose setae omitted,  $\times 77$ ).

Pleon somites with upper edge of antennal groove spinose (first to fourth); first three each with a pair of dorsal spines; fifth somite slightly widened proximally as in female.

Peduncle of uropod two and three-fourths times as long as telsonic somite and two and one-third times as long as endopod, which has half a dozen spines on inner edge.

Length, 5.5 mm.



*Loc.* New South Wales: 5½ to 7½ miles off Cape Three Points, 41–50 fath., on sticky mud and shell ("Thetis" Station 13, Feb., 1898); 5 and 4 miles east of Port Hacking, 100 and 80 metres on mud ("Cronulla" Trawl Station, July, 1943 and July, 1944); 4 miles off Eden, 70 and 60 metres, in silt (type loc., K. Sheard, Oct. and Dec., 1943). Types in South Australian Museum, Reg. No. C. 2531–2532.

This species is extraordinarily close to the genotype *armata* Bonnier (1896, pp. 541 and 544, pl. xxix, fig. 1–2) from northern latitudes (40°–61°), but according to the descriptions there are differences sufficient to warrant separation, especially in view of the widely separated regions.

Bonnier's figures and those of Calman also (1906, p. 419, pl. xxvii, fig. 13–20) show the posterior end of the carapace of the female as less tumid than in that sex of *sordida* and the fifth pleon somite is scarcely or not at all dilated proximally. The second maxilliped is similar, but the first large tooth (behind the falcate termination of the last joint) is more slender and the next has no accessory tooth; also, the two large proximal teeth are wider. The carpus of the third maxilliped has the inner margin of carpus dentate but with no large outstanding tooth, and the merus is toothed on its inner edge. Bonnier shows the dactylus of the second pereopod as longer than (female), or fully as long as (male) the carpus and propodus combined; in *sordida* it is much shorter.

Calman states that *armata* is commonly encrusted with mud. All examples of the Australian form are thickly clogged with silt and organic material. So closely does the covering adhere that it was necessary to boil the third maxillipeds and pereopods, after removal, in weak caustic and to then brush off the deposit before details could be made out. The character of the surface of the body cannot be seen until the concealing material is removed but the coating together with the dorsal prominence of the carapace and the general shape make it very easy to separate the species from other Cumacea in the samples.

## SUMMARY.

Twenty-five species of the family Nannastacidae, from southern and eastern Australia are described as new and others are discussed. The new forms are: *Nannastacus inconstans*, *clavatus*, *asper*, *sheardi*, *inflatus*, *subinflatus* and *johnstoni*. *Schizotrema aculeata*. *Cumella munroi*, *cana* and *turgidula*. *Campylaspis thompsoni*, *similis*, *unisulcata*, *uniplicata*, *rupta*, *latidactyla*, *minor*, *triplicata*, *roscida*, *echinata*, *pustulosa*, *aspera* and *thetidis*. *Procampylaspis sordida*.

The monotypic *Picrocuma* Hale is included in the family and keys are given to the species of the large genera *Nannastacus* and *Campylaspis*. The new *Procampylaspis* closely resembles the boreal genotype.

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